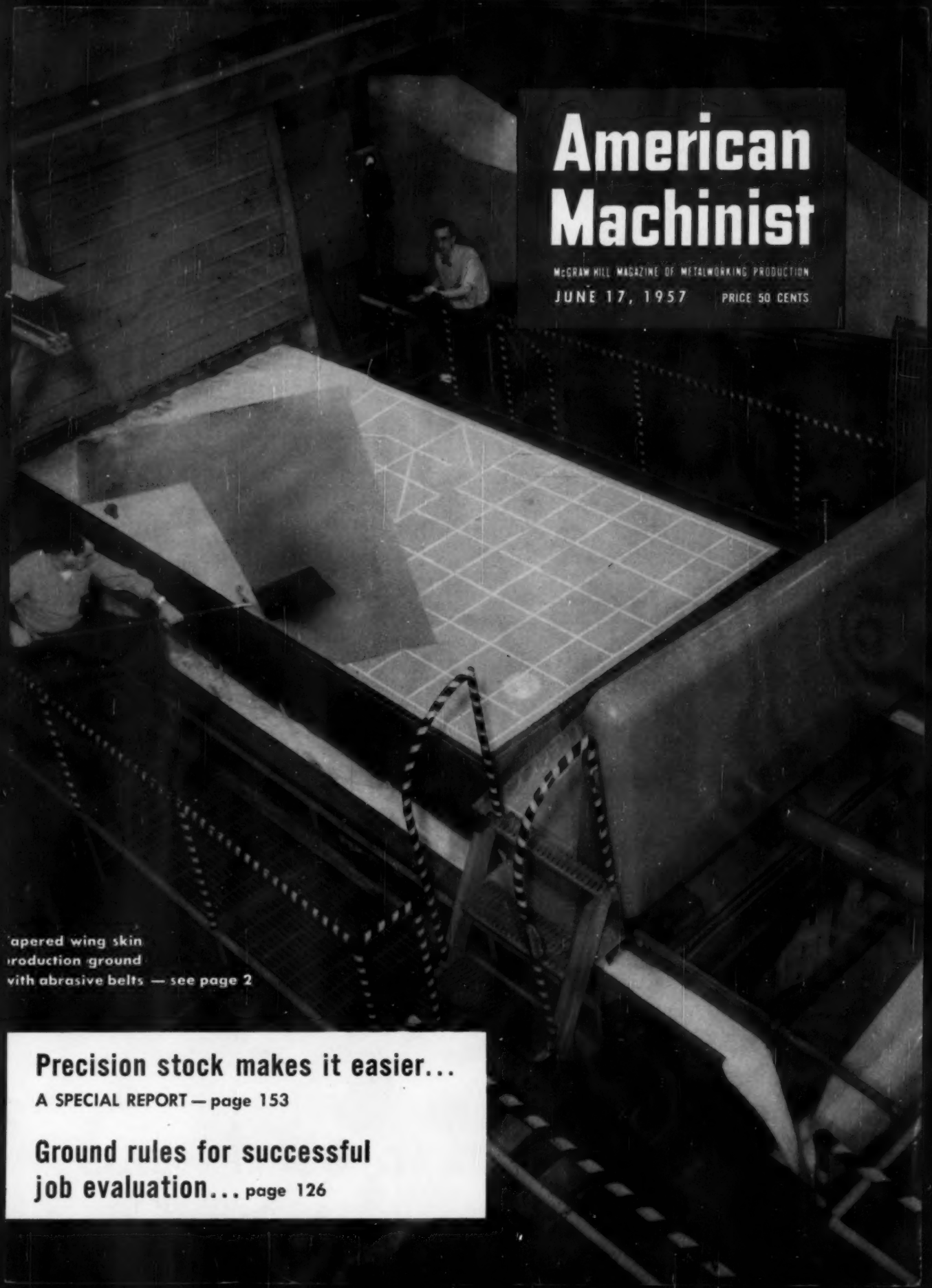


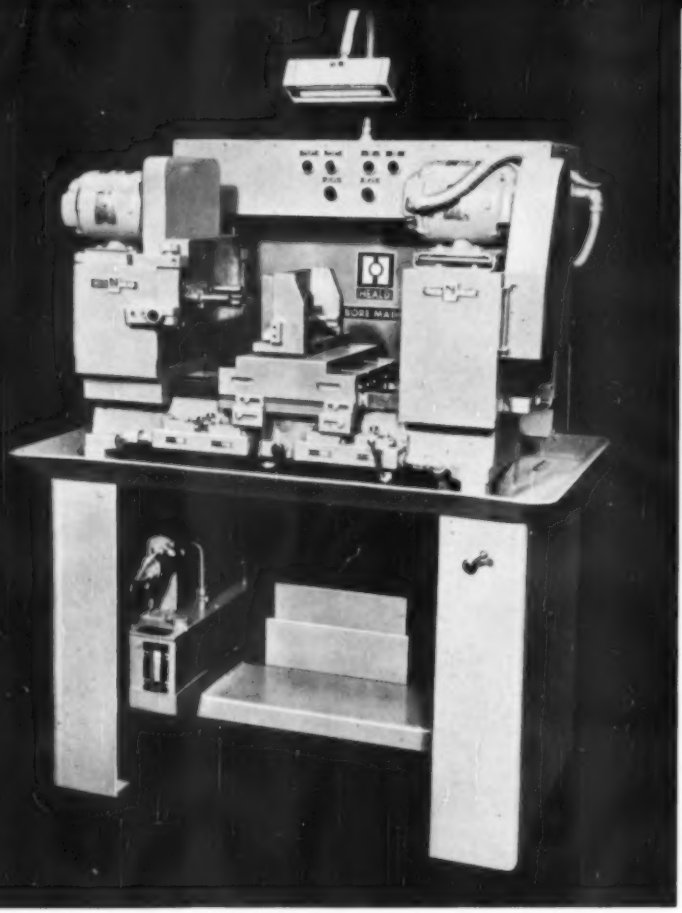
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
JUNE 17, 1957 PRICE 50 CENTS

'apered wing skin
›roduction ground
vith abrasive belts — see page 2

Precision stock makes it easier...
A SPECIAL REPORT — page 153

Ground rules for successful job evaluation... page 126



HEALD ANNOUNCES A

New Concept

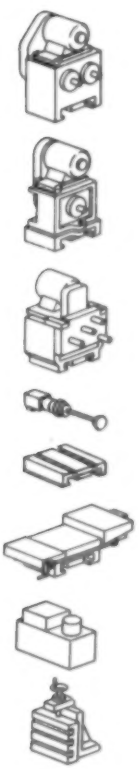
IN BORIZING VERSATILITY

It's the UNIT-TYPE Bore-Matic that puts custom-built machine design on an "off-the-shelf" basis!

HERE, for the first time, is a small, compact Bore-Matic precision finishing machine that gives you complete flexibility of design. Its unique "building block" arrangement, with standard interchangeable head units and accessories, provides practically unlimited versatility for meeting all of your small-work Borizing requirements with minimum machine investment.

Basically, the Model O Bore-Matic consists of a precision-built base-way unit with hardened and ground box-type ways, hydraulically operated table, hydraulic power unit and all necessary controls. A variety of Boringhead units, complete with motor drive, can be interchangeably mounted on the table ways at either or both ends of the machine with precise alignment.

This Model O unit is built to the same high standards of accuracy and precision as any other Heald Bore-Matic. It will easily hold tolerances of .0002 on regular production work and is capable of the same type of Borizing operations as a larger Bore-Matic. Because of its great versatility and relatively low cost, it extends the advantages of Heald precision to specialized operations and small shops where other types of equipment have previously been used. Ask your Heald representative for complete information, or send for a copy of new Model O Bulletin.



THE MODEL O BORE-MATIC CAN USE THESE STANDARD UNITS IN ANY COMBINATION

BORINGHEAD and DRIVE UNIT for one or two Red Head Boringheads.

SWIVEL BORINGHEAD and DRIVE UNIT for single Red Head Boringhead—swivels 20° for taper boring and turning.

MULTI-SPINDLE BORINGHEAD and DRIVE UNIT for miniature precision Red Heads. Interchangeable spindle plates bored for any practical number and location of heads, as close as ¾" on centers.

HYDRAULIC CROSS-FEED UNITS for standard and Multi-Spindle boringheads — permit grooving and facing with rotating tools.

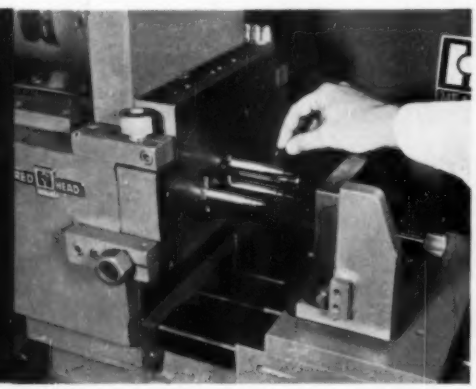
HYDRAULICALLY-OPERATED TABLE with rack and pinion drive—for mounting work or tooling which does not require indexing.

HYDRAULIC OR MANUAL CROSS SLIDE attaches to machine in place of table — permits indexing of work or tooling.

COOLANT PUMP and TANK UNIT with chip basket—for wet Borizing.

VERTICAL SLIDE mounts on table or cross slide — for manual vertical indexing of work.

NEW MULTI-SPINDLE Boringhead permits simultaneous multiple-hole Borizing on close centers



IT PAYS TO COME TO HEALD!

HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

NEWS REPORT ..

. . . Spot News . . 105
. . . Washington . . 107
. . . Detroit . . 109
. . . Machine Tools . . 111
. . . What's Ahead . . 115
. . . General News . . 170
. . . Field Report . . 178
. . . Names . . 181

Departments...

Letters . . 98
Editorial . . 119
Practical Ideas . . 148
Round Table . . 137
. . . Discussion . . 236
Talking Shop . . 169
New Equipment . . 182
New Books . . 260
New Films . . 262

contents for June 17, 1957

VOLUME 101, NUMBER 12

Electroforming thin films to close tolerances . . . Nickel plating on a beryllium-copper base produces a pattern of letters and digits. *By Robert W Hampson.* **121**

Talented tooling . . . A belt grinder for small rotors, improvements on the Artos wire cutter, a tilted lathe baseplate, and local tin plating to improve bearing fit. **124**

Ground rules for successful job evaluation . . . An exchange of correspondence between a nationally known arbitrator and a management consultant on how to handle job evaluation in labor contracts. *By E E Hilpert and George E Sanders.* **126**

Progress report on tapered-skin belt grinder . . . It has cut cycle times up to 50%, removes aluminum at 14 cu in. per min. *By Joseph R Burns, Bell Aircraft Corp.* **130**

Cost-cutting ideas from IBM . . . A baker's dozen of tooling tricks developed by IBM process engineers. *By H E Linsley.* **134**

How to design knockouts . . . Second part of the section on stripper design, from the *14 Steps to Design A Die* series. A score of ideas on how to use the three types of knockout. *By J R Paquin.* **138**

Sell quality to the people who build it . . . You can't order quality consciousness, you have to build it as a concept in the minds of the people responsible. Here is how one company did that. *By Joseph F De Klotz, Rheem Manufacturing Co.* **144**

SPECIAL REPORT NUMBER 445

Precision stock makes it easier . . . Less machining, lower investment, and quicker production can result from the use of precision stock. Here is information on what is available and to what tolerances. *By Charles Emerson.* . . **153**

REFERENCE BOOK SHEETS

How to check squares, I, II, III . . . A half dozen ways to check the accuracy of squares. *By Charles Minaire.* **163**

American Machinist *Chips*

Cover . . .
Operator uses a squeegee to remove coolant from surface of work on the tapered-skin belt grinder at Bell Aircraft. Blue color on the work comes from layout fluid. For a progress report on work with this special grinder, see page 130.

Precision Stock . . . More mistakes in buying may stem from looking only at the cost per pound than from any other source. Thus, the cheaper price of hot-rolled stock may sometimes lure a plant into using it for an application on which money would be saved by paying the higher price of stock that is already ground to a precision size or shape. Not always, to be sure, but the possibilities for savings in time, in machine hours, and in money should be checked.

To help you do this, Associate Editor Charles Emerson has spent several months studying the subject of precision stock. Chuck has condensed his research into the Special Report starting on page 153. You will find in this report summaries of what materials are available in the precision form and, equally important, what sizes are available. There are also suggestions on when to—and when not to—consider precision stock.

Those 14 Steps . . . to design a die keep rolling along and J R Paquin continues to add to the valuable basic information on this subject. Step 10 deals with strippers and has turned out to involve so many basic variations that we had to split it into two parts. Part 1, covering stripper plates, appeared Apr 22 '57, p140. The second part covers knockouts. With some difficulty we refrain from making the obvious comment and say you'll find it on page 138. Fans of Mr Paquin need no further information.

Gold in that satellite . . . We are happy that several readers have called our attention to the fact that we repeated a single Talking Shop item in our two May issues. We are not so happy that it happened. Managing Editor Ashburn, who writes most of that column, blames it all on the printer for setting the copy twice and for his being away when it was used the second time. Knowing the woes of filling a regular column, Andy, we're suspicious, but forgiving. Incidentally, we understand that there will still be gold plate on the inside of the satellite for heat resistance along with the vaporized aluminum on the outside for heat reflection.

Coming . . . *AM* for July promises a varied fare ranging from the grinding of cast iron to hard-nickel plating. You'll find a report on an unusual development in forming with rubber pads that the Russians are trying, there is a story on the unusual problems in making X-frames for autos, and you'll get the word on how to put to work those ratios we have been talking about in our series on management for the small plant. A little further over the horizon, in July 15, we can hint that you can expect something even more startling than usual.

ALBERT HAUPTLI publisher

BURNHAM FINNEY editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT Detroit editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor
GOSTA WERNBERG assistant editor
RICHARD T BERG assistant editor
JOHN J DWYER, JR assistant editor

RICHARD E ROOMAN art director
JOSEPH S POZNANSKI assistant
ANNE PALMER assistant
MATTHEW T HAGGERTY assistant

ROBERT SHEETS news editor
HARRY HOMEWOOD Detroit
ROBERT E COCHRAN Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
MICHAEL J MURPHY Los Angeles
CHARLES T DIXON, JR Atlanta
KEMP ANDERSON, JR Dallas
WILLIAM J COUGHLIN London
ROBERT E FARRELL Paris
PETER WEAVER Rio de Janeiro
MORRIE HELITZER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
ROBERT C MATTOON circulation manager
CATHERINE C KANE manager, reader service

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index. American Machinist publishes its own annual index; this is available on request to the editor.

American Machinist, published bi-weekly, with an additional issue in mid-September, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, CIRCULATION, ADVERTISING and PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd St, New York 36, NY. Donald C. McGraw, President; Joseph A Gerardi, Executive Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President and Director of Advertising Sales; A R Venezian, Vice President and Circulation Coordinator.

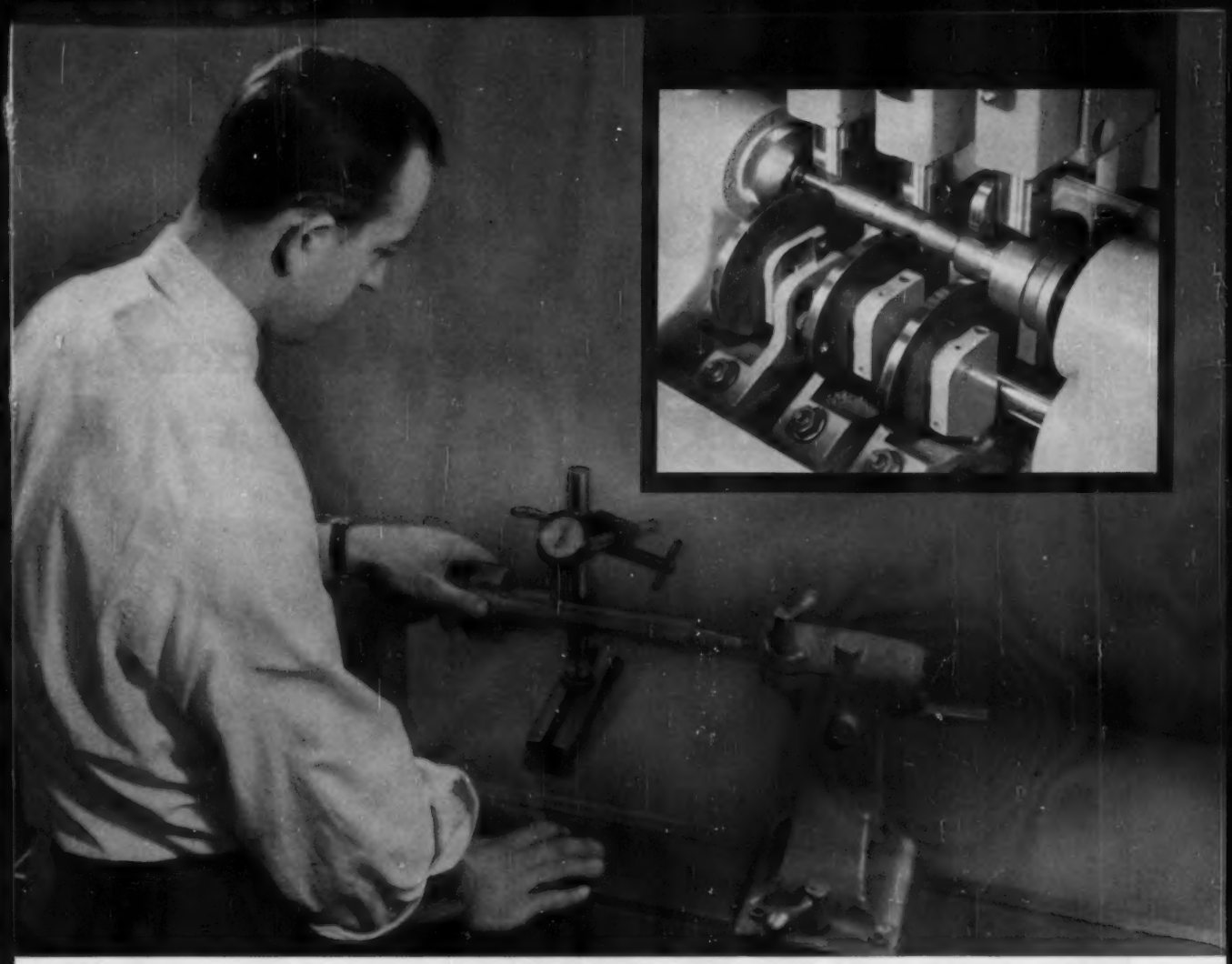
Subscriptions are solicited only from production executives and engineers in the metalworking industries. **Position and company connection must be indicated on subscription orders.**

Postmaster: Please send form 3579 to American Machinist, 330 West 42nd St, New York 36, NY

United States subscription rate for individuals in the field of the publication $5.00 per year, single copies 50 cents, foreign $25.00 per year, payable in advance. Second-class mail privileges authorized at New York, NY. Printed in USA. Title registered in U S Patent Office.

© Copyrighted 1957 McGraw-Hill Publishing Co, Inc, all rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, American Machinist, 330 West 42nd St, New York 36, NY. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.



How this shaft was quenched and straightened *at the same time*

This shaft reads true because it was not allowed to distort during hardening.

The manufacturer used a Gleason No. 140 Rolling Quench Machine to straighten the shaft *while it was being quenched.*

Since cold straightening was completely eliminated, he saved valuable production time and expense.

The quenched shaft also has less residual stress.

With this machine you roll parts under pressure continuously as you quench them. The operator puts the hot part on the lower rollers and starts the machine.

From there on the operation is automatic. Rolling speed, pressure and oil flow have been pre-set to meet specifications.

The Gleason No. 140 Rolling Quench Machine is suited equally well to both small and large quantity work. It accommodates shafts $\frac{3}{16}''$ to 4″ in diameter, 6″ to 40″ in length, with integral cams or shoulders up to 8″ diameter.

Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling.

Write for further information.

The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

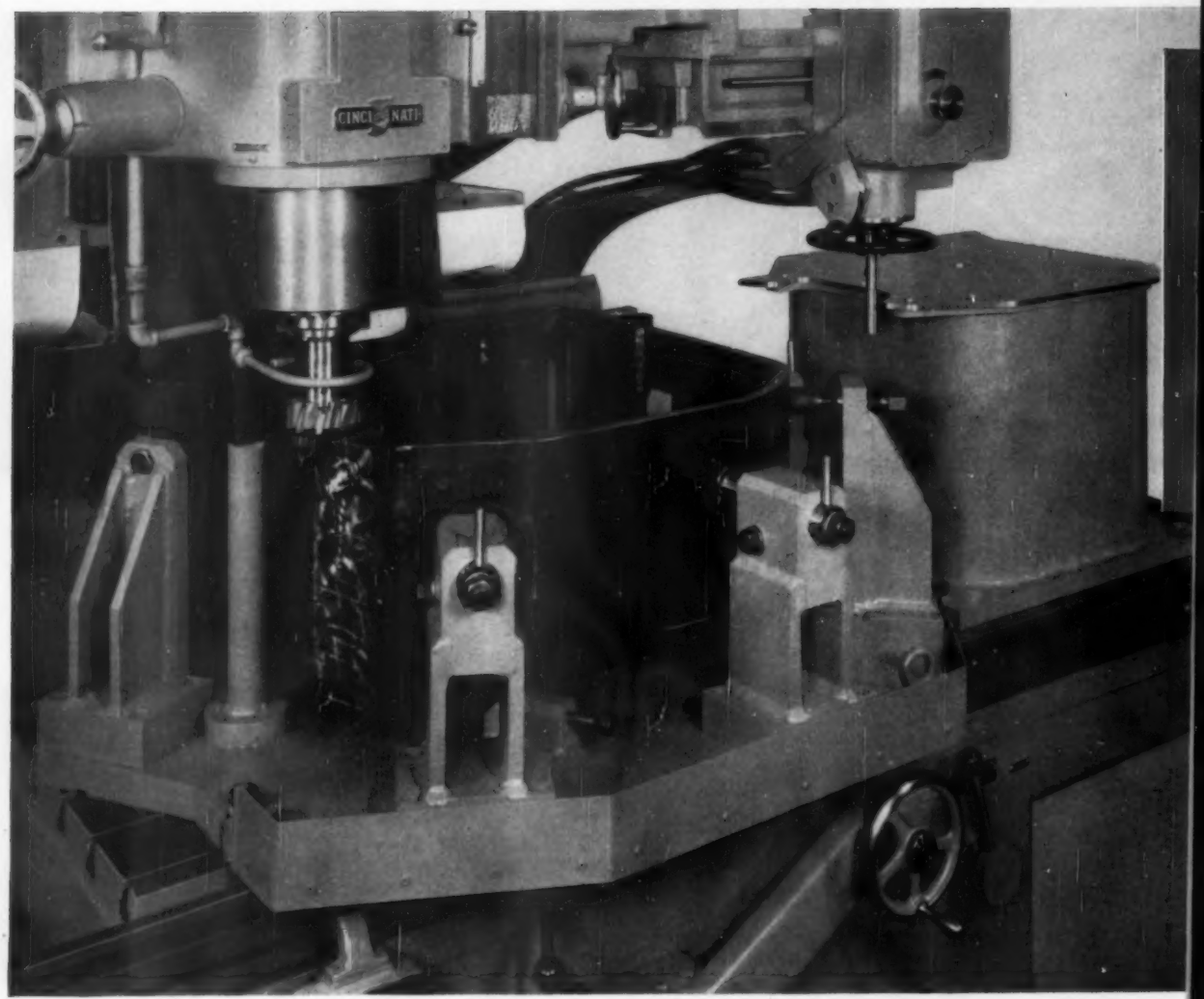
GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

25″ x 33″ Profile

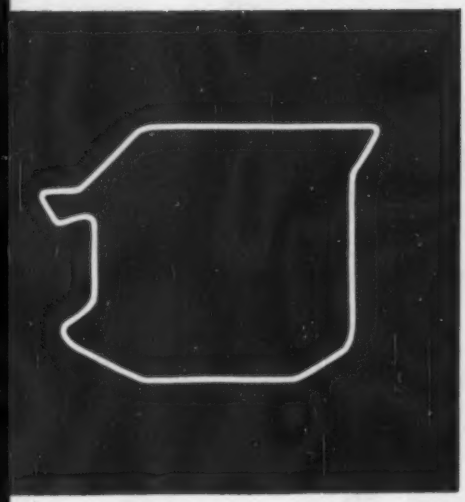
Milled Automatically



Entire profile edge of large weldment is automatically milled in one continuous cut, on this CINCINNATI 28″ Vertical Hydro-Tel Milling Machine, equipped for 360° Automatic Profile Milling. Note how machine handwheels can be swiveled out of the way to accommodate overhang of large fixtures.

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

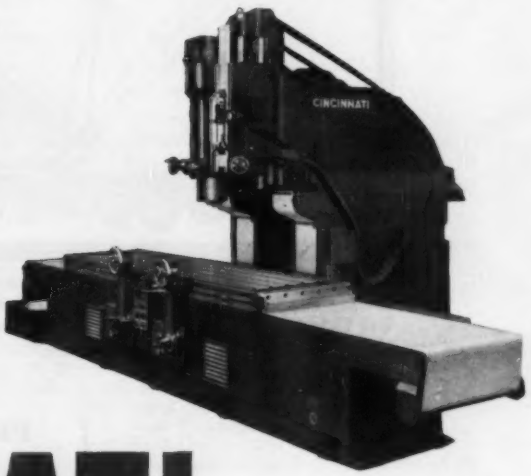
on CINCINNATI 28" VERTICAL HYDRO-TEL...



Variety of curves in the above template are scanned automatically by the tracing finger extending from the Hydro-Tel's 360° Automatic Profile unit.

There are two ways to mill large two-dimensional profiles. The hard way, when the operator uses two hands to control table and cross traverse, while keeping his eyes glued on the work and cutter. Or the easy low-cost way, automatic profile milling on a CINCINNATI® 28" Vertical Hydro-Tel like the one illustrated here. This equipment greatly simplifies the operator's job. After he loads the fixture the automatic profiling unit takes charge of the operation, scanning the curvature of the template while automatically controlling the table and cross feed to mill the exact profile of the template. ¶ This production idea can be extended to machine two, three or four parts at one time, with the corresponding two-, three- or four-spindle head. There's no floor under costs when you plan your milling operations on a CINCINNATI Hydro-Tel. Cincinnati builds four machines of this type: 16", 28", 30", 36". All are "spec'd" in Sweet's. Complete data for the 28" size may be obtained by writing for catalog No. M-1773-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI 28" Vertical Hydro-Tel Milling Machine. General-purpose style illustrated. Can be equipped for die sinking and/or automatic profile milling, or multiple spindle production milling. Catalog No. M-1773-2.

CINCINNATI

HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

POWER to build. delivered

Lorain-56 Shovel-Crane is 1¼ yard shovel, 25-ton crane, or 30-ton crane as desired, features torque converter to absorb working shocks and stresses, 2-lever air controls for easier operation.

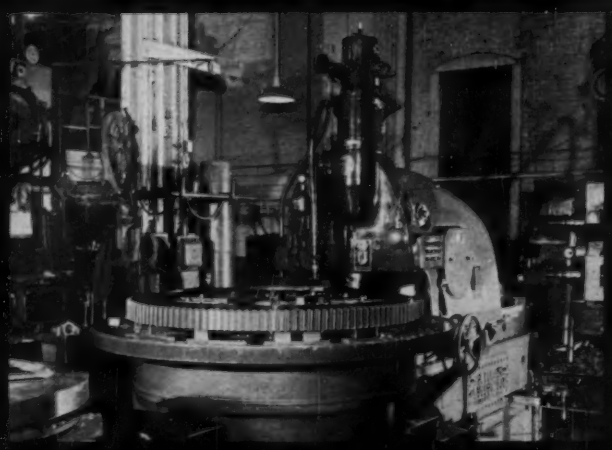
Lorain Moto-Cranes* combine speed, power and versatility available in a range of lifting capacities from 7 to 75 tons. Multiple speed transmission, multiple big tires provide exceptional off-road mobility.

THE PRECISION LINE

Fellows

*Reg. U.S. Pat. Off.

America's Highways...
by FELLOWS-CUT GEARS



120-Inch Gear Shaper set-up for 138-tooth cast steel gear of 290-330 Brinell, 5" face width, 1.783 C.P., 1.180" total depth of cut. Four cuts—1181 min. approx.

100-Inch Gear Shaper cutting 73-tooth internal gear, 3½" face width, 1.8235 D.P., 1.007" depth of cut. Material—steel casting 197-235 Brinell. One cut—320 min. approx.

The machines that move mountains of material for America's highway programs demand good, rugged, smooth running gears that will transmit, without failure, the many tons of force required.

The well known Thew Shovel Company of Lorain, Ohio is one of the major construction equipment makers that use Fellows machines to produce these gears. The largest Thew-Lorain gears require the largest capacity Gear Shapers in the Fellows Line, the 100-Inch and the 120-Inch.

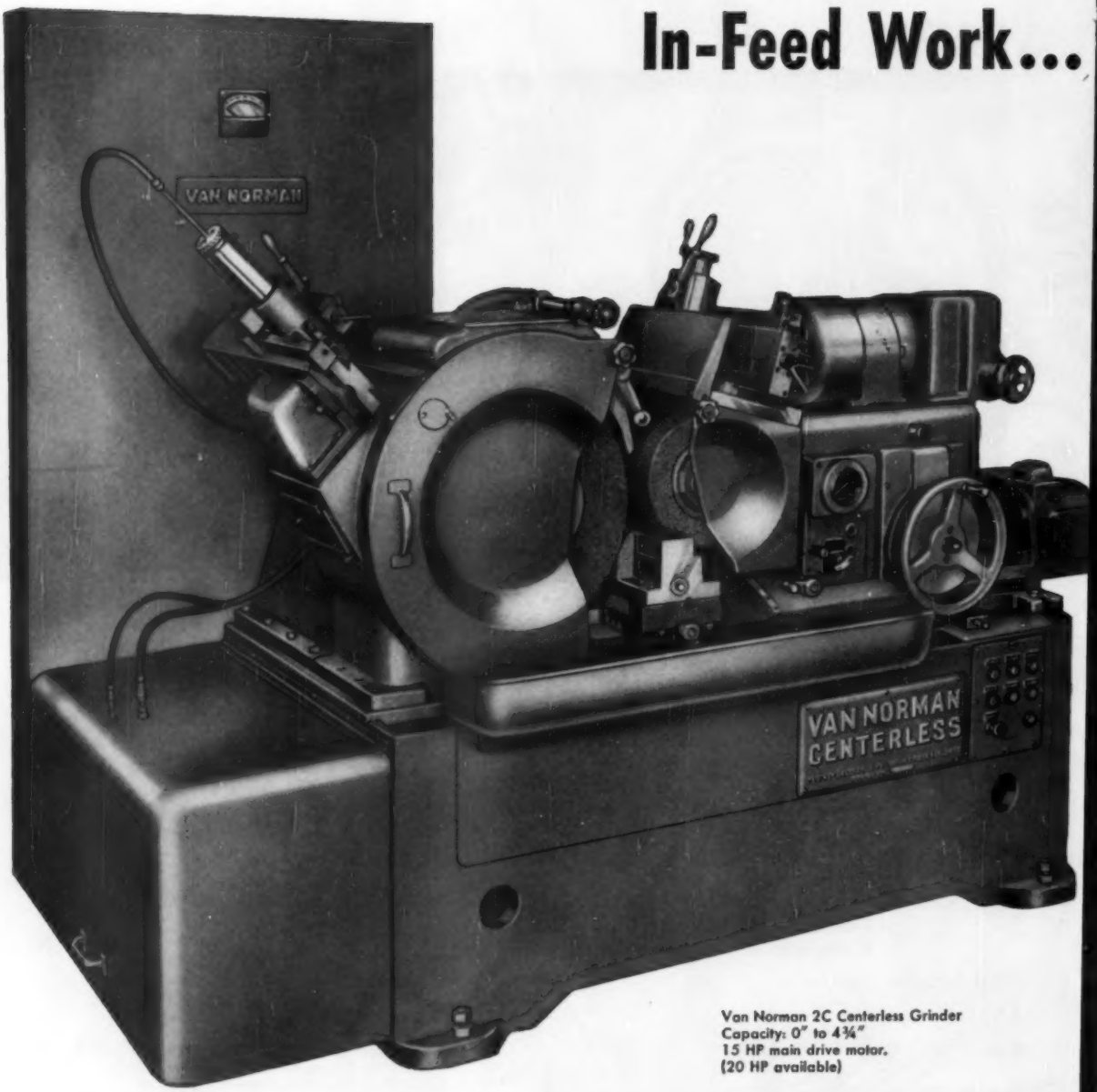
These two Gear Shapers are designed to take heavy cuts at coarse feeds on spur or helical gears. Capacities: 28" to 100" for externals and 46" to 100" for internals on the 100-Inch; 28" to 120" for externals and 46" to 120" for internals on the 120-Inch. Maximum face width on each is 8".

For *full* information about the complete Precision Line of cost-cutting Fellows Gear Production Equipment get in touch with your Fellows representative. Write, wire or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Gear Production Equipment

Now you can do: Thru-Feed Work... In-Feed Work...



Van Norman 2C Centerless Grinder
Capacity: 0" to 4¾"
15 HP main drive motor.
(20 HP available)

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

...Form Grinding...Profile Work...

with ONE

VAN NORMAN 2C
Centerless Grinder

Featuring a 15 HP main drive motor which provides ample power for every grinding job, the Van Norman 2C Centerless Grinder actually gives you the facilities of *3* centerless grinders . . . standard grinding for thru-feed work . . . standard grinding for in-feed jobs and, equipped with crush dressing attachment, form grinding and profile work.

Get complete details on this newest in the expanding line of Van Norman grinders. Write, wire or telephone today for descriptive catalogs.

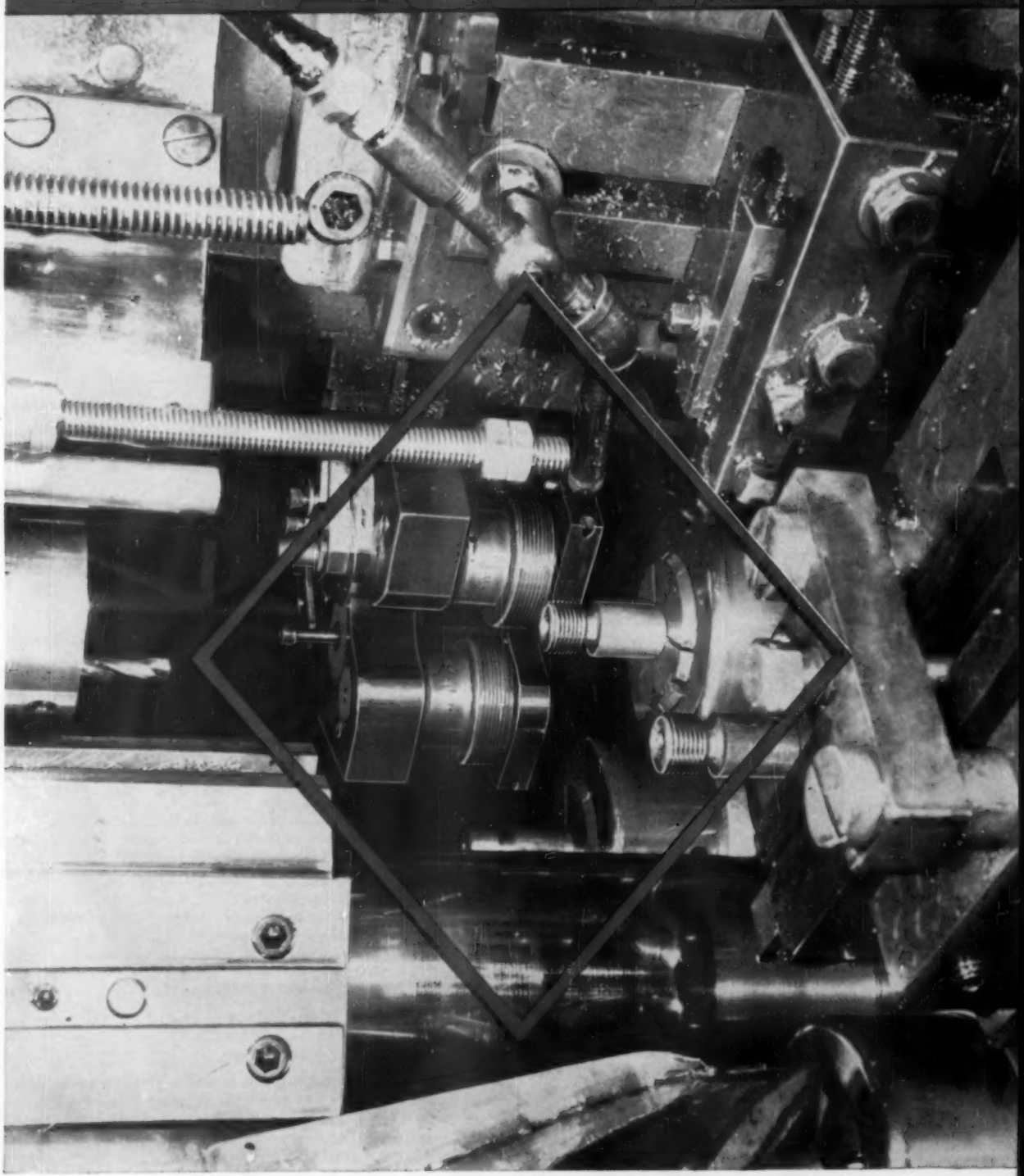
Check these features of the Van Norman 2C Centerless Grinder:

- √ Hard chrome plating of regulating wheel slide preserves original factory built-in accuracy.
- √ Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life — assuring rigidity and accuracy previously unobtainable in centerless grinding, vibrationless operation.
- √ Spindles require no warm-up period, eliminating "creep."
- √ Infinitely variable regulating wheel drive.
- √ Combination straight and profile hydraulic wheel dressers for each wheel.
- √ **Crush dressing attachment**

COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years.

1/2" taper pipe thread



rolled with the LANROLL attachment

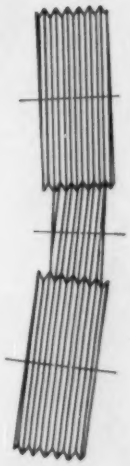
The recently developed LANDIS Method for precision rolling of taper pipe threads is shown at the Mac-It Parts Company, Lancaster, Pennsylvania, in the production of pipe plugs.

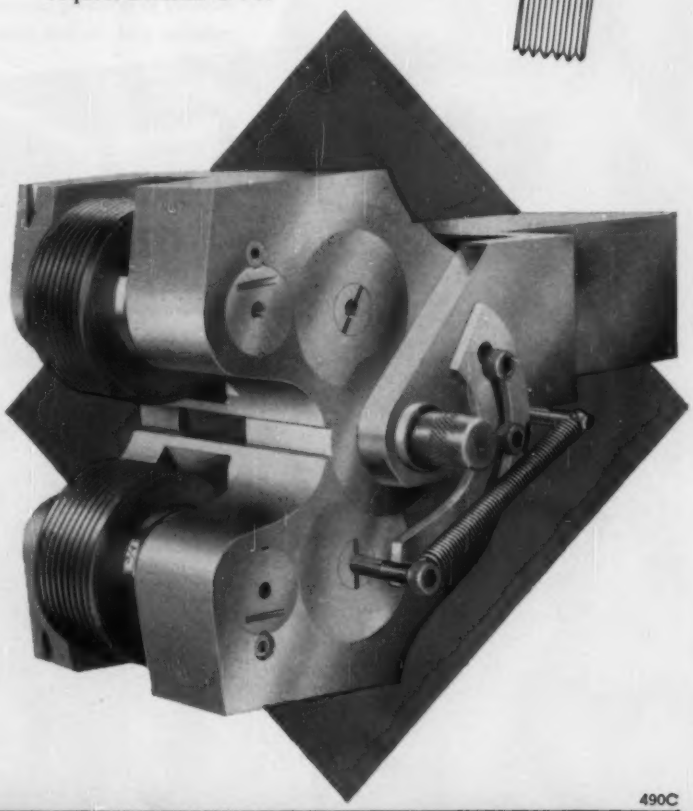
1/2" 14 pitch American Standard Taper Pipe threads are being rolled 9/16" long to dry seal specifications on 4140 steel (207 Brinnell). The #22GA LANROLL Attachment (with a pipe range of 1/8" to 1") is used in the third position on a National Acme Bar Automatic —45,000 pieces are threaded with each set of rolls.

To produce the taper, the rolls of the LANROLL Attachment are supported on carbide shafts inclined to the required thread taper. This design enables the use of parallel rolls (see diagram) which reduces slippage between the workpiece and rolls. With reduced slippage, roll life is materially increased. In addition, attachment stabilization (limited sidewise movement) is greatly improved to permit rolling directly to a shoulder with safety.

A highly desirable design feature of the LANROLL Attachment is the ability to remove the attachment from the shank by simply withdrawing the shank pin. By this means, machine tooling changes or attachment servicing can be accomplished without disturbing the original set up. This same construction facilitates, through the use of a gage, a precision, safe means for locating the attachment on the tool slide in respect to the high point of the machine's feed cam. Also, it allows attachment tipping to avoid indexing interference on screw machines having a limited tool slide movement. The same LANROLL Attachment will produce either straight or taper threads by using the proper rolls and an important but limited amount of auxiliary equipment. They provide wide range coverage while retaining the rigidity of a non-adjustable tool—assuring operation for every size within its range as though it were exclusively engineered for the particular work being threaded.

For complete information on the LANDIS Method of rolling taper threads and other outstanding design principles, please write and request Bulletin G-96.



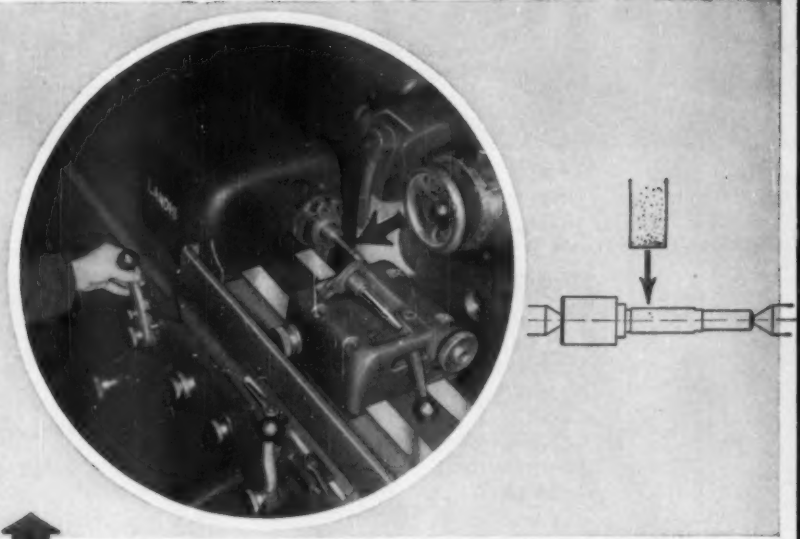


490C

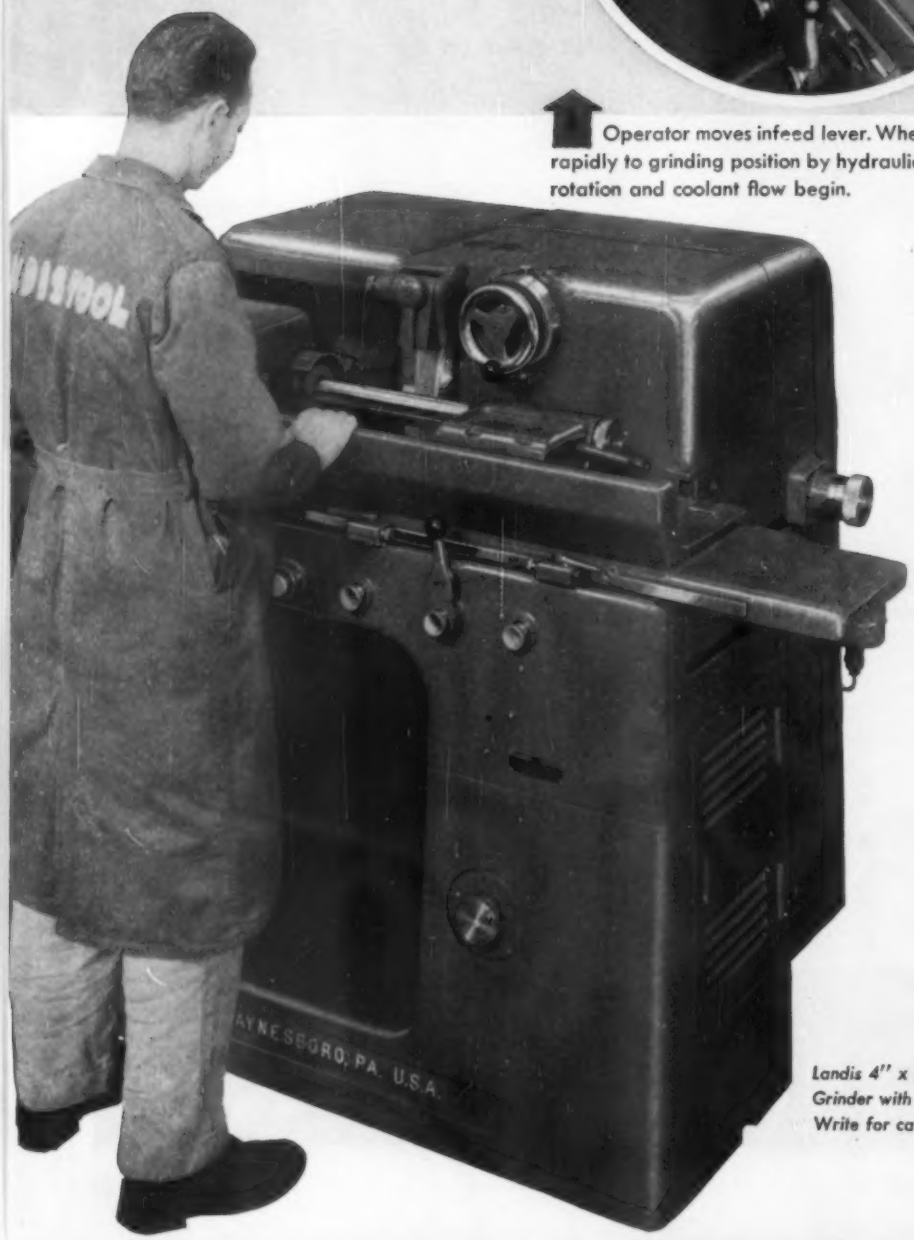
LANDIS Machine COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Landis automatic cycle cuts

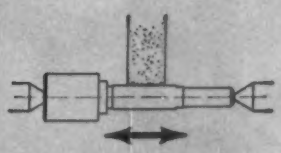


Operator moves infeed lever. Wheel head moves rapidly to grinding position by hydraulic power. Work rotation and coolant flow begin.



Landis 4" x 18" Type H Plain Cylindrical Grinder with extra cost semi-automatic cycle. Write for catalog A-54.

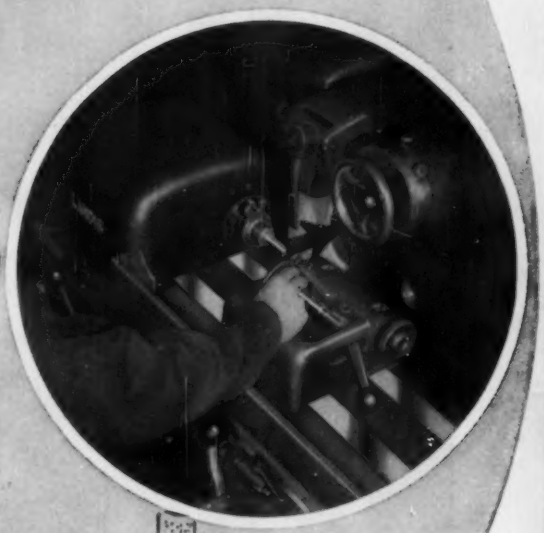
unit grinding costs up to 50%

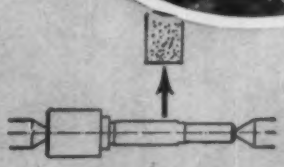


1 Hydraulic slow grinding feed and hydraulic traverse operate automatically. Operator changes dogs on workpieces during grinding period.

2 Wheel automatically moves back after work has been ground to pre-set size. Coolant stops and infeed lever re-sets.

3 Operator moves footstock lever to unload and load workpieces. Cycle ready to repeat.



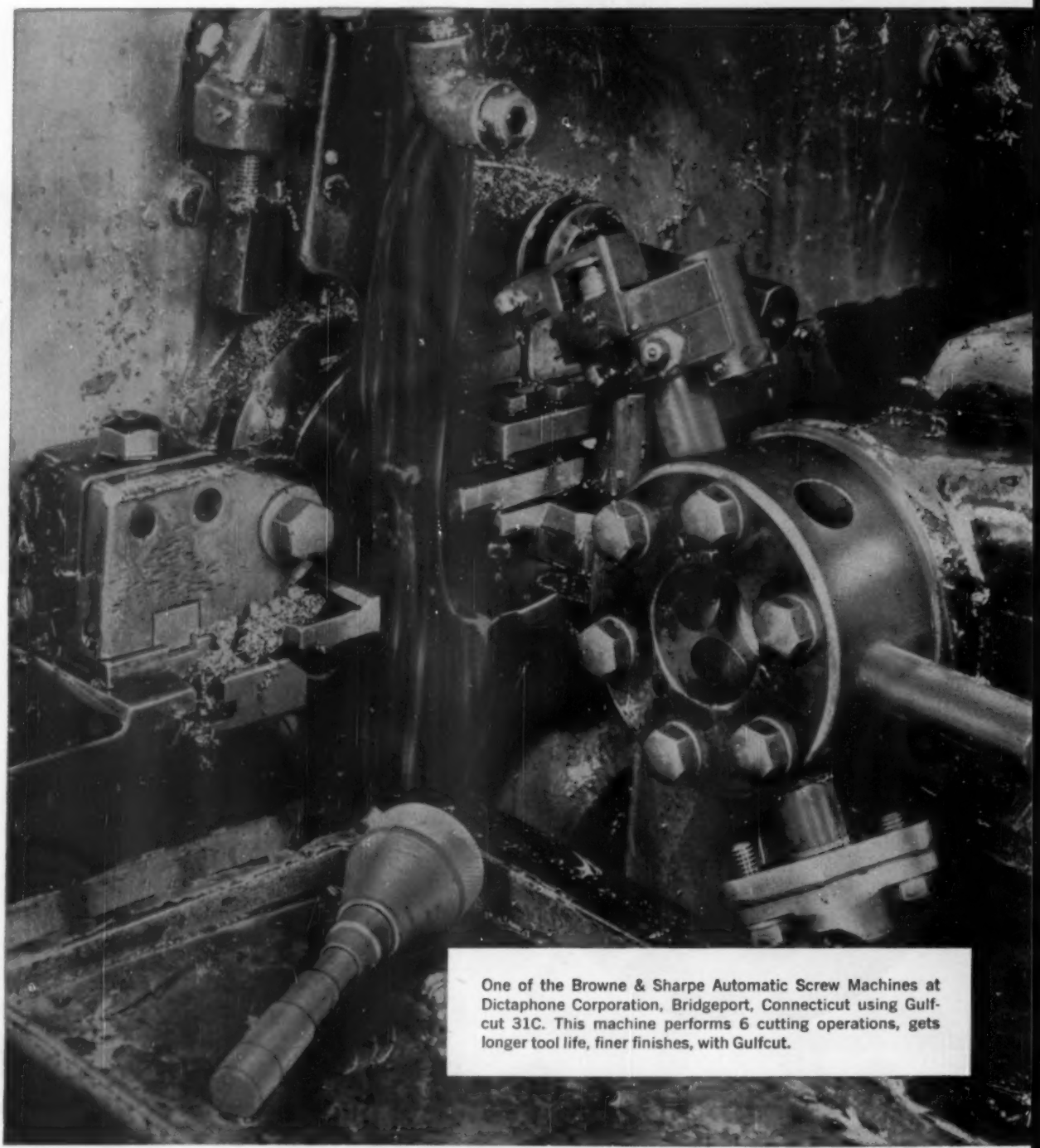


LANDIS
precision grinders

LANDIS TOOL COMPANY
WAYNESBORO, PENNSYLVANIA

At Dictaphone Corporation, Bridgeport, Connecticut...

Closer tolerances, better



One of the Browne & Sharpe Automatic Screw Machines at Dictaphone Corporation, Bridgeport, Connecticut using Gulfcut 31C. This machine performs 6 cutting operations, gets longer tool life, finer finishes, with Gulfcut.

finishes, fewer rejects ...with GULFCUT!

Dictaphone has used Gulfcut 31C since Gulf first introduced this cutting oil—has used it exclusively for the past 10 years. On brass, bronze, aluminum, or any of the several types of steel used in manufacturing precision parts for Dictaphone Machines . . . *one* cutting oil, Gulfcut, does the job!

Says Joseph A. Maloney, Process Engineer: "Day in, day out, our machines are producing fine quality work, using Gulfcut. We get steady production at an even rate—hold tolerances as close as 3 ten thousandths. Gulfcut 31C provides the necessary combination of lubrication and cooling that leads to longer tool life, better finishes, with fewer rejects."

Whether you need a mineral-lard oil, a sulfurized-mineral oil, a sulfurized-mineral-lard oil, a sulfo-chlorinated-lard oil, or an emulsifying oil (the Gulfcut line includes all of these) . . . call your Gulf Sales Engineer. He will be glad to recommend the proper cutting oils for *your specific needs.*

Joseph A. Maloney, Process Engineer at Dictaphone, and J. A. Magill, Gulf Sales Engineer, observing Gulfcut 31C at work on precision parts. Gulfcut cutting oils excel over a wide range of cutting applications . . . help to reduce machining costs.

GULF OIL CORPORATION

1822 Gulf Building, Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Cincinnati Automatic

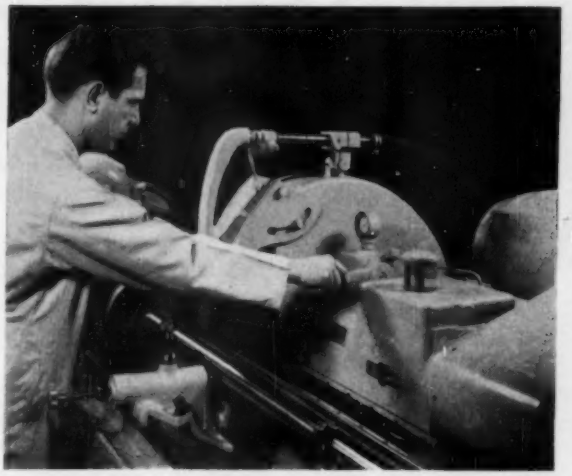
Improves the Entire

Have you ever seen an operator balance a grinding wheel mount on conventional static balancing ways? It's a tedious operation, and may require 90 minutes or more to remove the wheel mount, balance and replace it. Cincinnati decided to do something about this. They developed automatic grinding wheel balancing . . . it does the job ten times more accurately and infinitely quicker and easier.

This exclusive Cincinnati feature automatically balances the grinding wheel mount on the machine . . . within a few seconds . . . while the spindle rotates at its operating speed. **This exclusive Cincinnati feature** eliminates vibration and resultant chatter on the work . . . permits more effective stock removal . . . reduces wheel cost per workpiece.

FILMATIC spindle bearings and automatic grinding wheel balancing constitute a team that just can't be beat for low-cost precision cylindrical grinding. Best of all, these features are standard equipment on CINCINNATI® FILMATIC 6"R, 10"L, 10"R, 14"L, 14" and 16" Plain Grinders, and on 6"R, 10"L, 10"R and 14"L Angular Wheel Slide Grinding Machines. Write today for the complete balancing story. Ask for publication No. G-637-2.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



In the illustration above the operator shows how easy it is to balance the grinding wheel on a CINCINNATI FILMATIC 10"R x 72" Plain Hydraulic Grinder.

Publication No. G-637-2 explains the Cincinnati Automatic Balancing principle. Write for a copy.

CINCINNATI

CINCINNATI

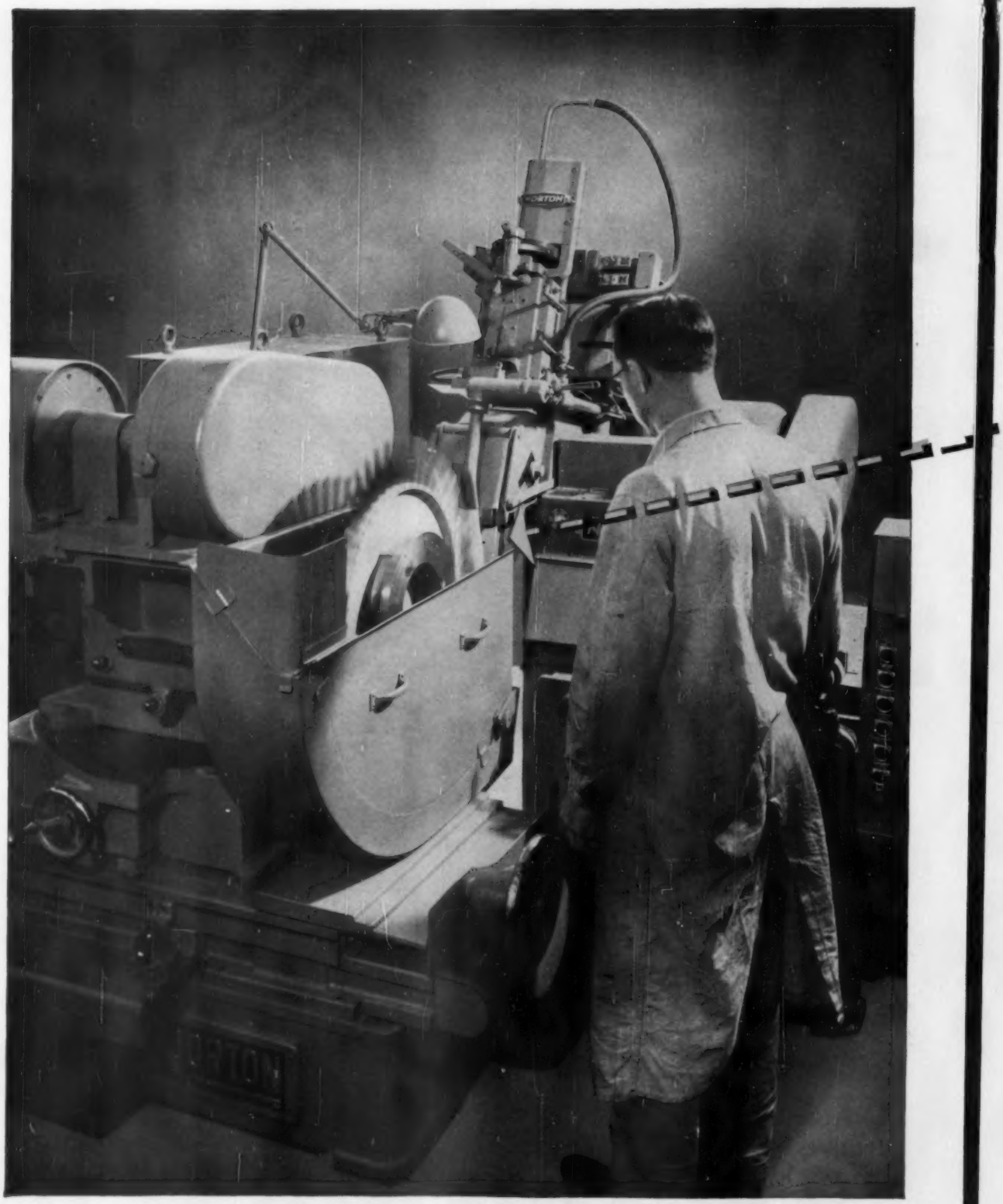
Wheel Balancing

Grinding Operation

Symbol of Automatic Grinding Wheel Balancing . . . the greatest timesaving feature to be found on any precision grinding machine.

Automatic Grinding Wheel Balancing and FILMATIC Spindle Bearings are exclusive Cincinnati features . . . they just can't be beat for producing the finest finish at the lowest cost on your precision ground work.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES



Grinding Short Parts With Large Diameters, like this compressor wheel, is a much faster and easier job on the Norton 42" Hi-Swing Semiautomatic Chucking Grinder. To the standard advantages of Norton semiautomatic design this machine adds many advanced features of its own for easier loading and unloading and faster, simplified operation. Results: less tiring work for your operators — a consistently higher production rate for *you*.

Now you can grind large diameter, short parts *fast!*

The Norton 42" Hi-Swing Semiautomatic Chucking Grinder features speed, adaptability and easy operation

For "Hi-Swing" in the name of the Norton 42" Hi-Swing Semiautomatic Chucking Grinder you can substitute "high speed," "high efficiency" or "high production" — and you'll be right every time!

Designed especially for rapid, accurate grinding of large diameter, short parts — such as jet engine compressor wheels and many similar components — it is particularly suited for jobs where both external and internal grinding are required. It takes work held by chucks, face plates or special fixtures and permits several surfaces to be ground without disturbing the set-up.

For easy operation

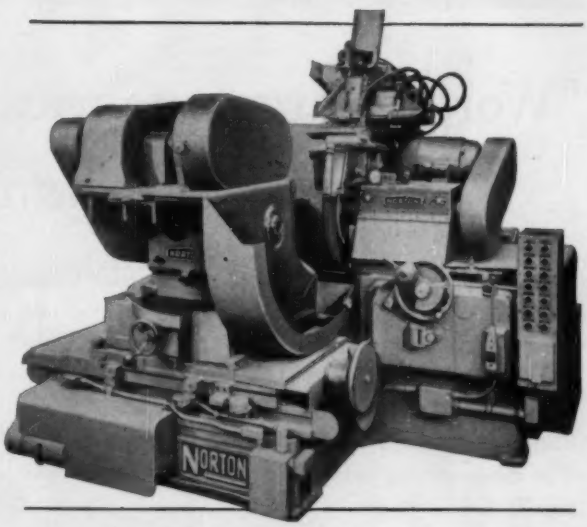
- Automatic or manual work rotation control by simple selector switch.
- Automatic or manual coolant flow control.
- Automatic feed cycle under one-lever control.
- Automatic wheel truing under push-button control.
- Excellent clearance conditions for loading and unloading.
- Maximum visibility of grinding action.
- All controls within easy reach of operator.
- Graduated wheel feed handwheel with "click-count" index.
- Power work head table traverse with automatic reverse by hydraulically operated rotating screw.

The automatic functions of the Hi-Swing Grinder combine to assure you a pre-determined, consistent rate of output. Advanced features like the wheel truing device greatly reduce the requirement of operating skill. And the careful consideration of the operator in the over-all design is still another factor that cuts down fatigue, saves time and enables continuous high production.

In your own plant

you'll find this pace-setting grinding machine a real profit-boosting production tool on many jobs that are now using up too much of your operators' time — and *your* money.

See your Norton Representative for further details on the 42" Hi-Swing Semiautomatic Chucking Grinder. Or write for Catalog. And remember: only Norton offers you such long experience on grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



Designed For Easy Maintenance, the 42" Hi-Swing Grinder has all pumps, motors and filters mounted outside . . . pressure relief valves for hydraulic and ways lubrication systems conveniently placed . . . ways lubricant flow control valves at end of base . . . hinged wheel guard cover eases change . . . ramped coolant tank outlet speeds clean-cut . . . electrical controls in raised enclosure for stand-up inspection.

To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

District Sales Offices:
Worcester • Hartford • New York • Cleveland • Chicago • Detroit

"World's largest fabricator of freight car parts" uses USS Galvanized Steel Sheets!

Standard Railway Equipment Manufacturing Company of Hammond, Indiana, manufacturer of specialty parts for freight cars, has made wide use of USS Galvanized Steel Sheets for many years. In the accompanying pictures, USS Galvanized Steel Sheets are being formed into freight car roof sheets. The deep corrugations have added strength and rigidity.

USS Galvanized Steel Sheets have the physical properties to stand up under the rigid forming requirements necessary to the production of roofs for box and refrigerator cars, cabooses, covered hopper cars, and component parts. USS Galvanized Steel Sheets have an even coat of zinc, and can be cut, stamped, rolled, spot-welded, soldered, or formed without danger of flaking or peeling.

If you use galvanized steel in your manufacturing operations, it will pay you to investigate USS Galvanized Steel Sheets. For more details, get in touch with a District Sales Office of United States Steel.

USS GALVANIZED STEEL SHEETS

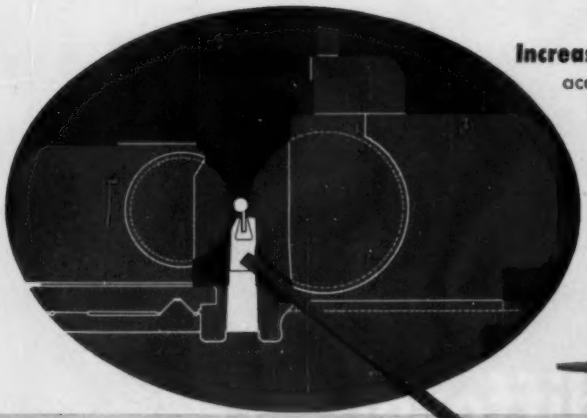
UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

UNITED STATES STEEL

Exclusive Landis feature increases centerless production... permits heavier cuts without loss of finish or accuracy



Increased production with better finish and accuracy because the stationary work rest is anchored solidly to heavy, rigid bed.

Landis No. 12
Centerless Grinder

condensed specifications	model #12	model #12½
Work capacity (diameter)	1/16"-3½"	½"-3½"
Standard Wheel Widths	4", 6", 8"	4", 6", 8", 10"
Wheel Drive Motors	15 hp. Max.	25 hp. Max.

LANDIS
precision grinders
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

There is a difference in contour attachments

A basic requirement of any contour attachment is to reproduce a template form in the work piece.

The difference in contour attachments is largely the degree of reproduction accuracy.

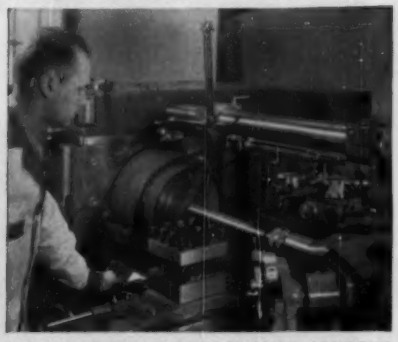
In Warner & Swasey Contour Attachments it is the MICRO-SENSITIVE HYDRAULIC CONTROL VALVE that makes a BIG DIFFERENCE.

The micro-sensitive hydraulic control valve with its flexure-pivoted stylus is another achievement of Warner & Swasey's creative engineering. It's built with instrument makers' precision and individually laboratory inspected to insure the ultimate in high-fidelity reproduction of your most exacting contours. THIS IS the BIG DIFFERENCE you get in all Warner & Swasey Contour Attachments.

Available on Warner & Swasey 3-A and 4-A Saddle Type Turret Lathes.

NEW WARNER & SWASEY HEXAGON TURRET CONTOURING SLIDE TOOLS—Exclusively designed for contour boring work.

Available on No. 5 Ram Type and 2-A, 3-A and 4-A Saddle Type Turret Lathes.



WARNER & SWASEY CROSS SLIDE CONTOUR ATTACHMENTS—The only turret lathe contour units that give you *cross center facing*. Also, the only attachments that give you both *turning* and *cross center facing* in one unit.

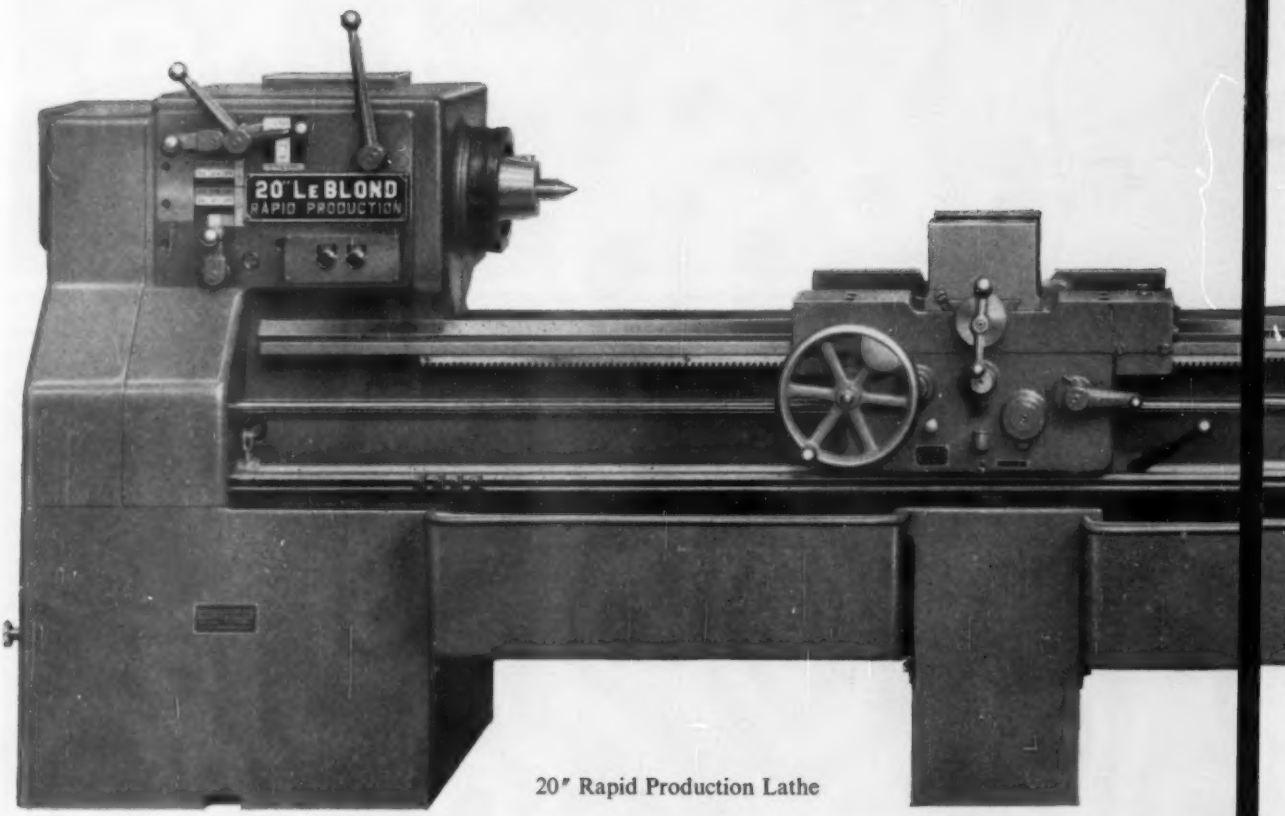
Micro-sensitive hydraulic control valve with flexure-pivoted stylus—the heart of all Warner & Swasey Contour Attachments.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...

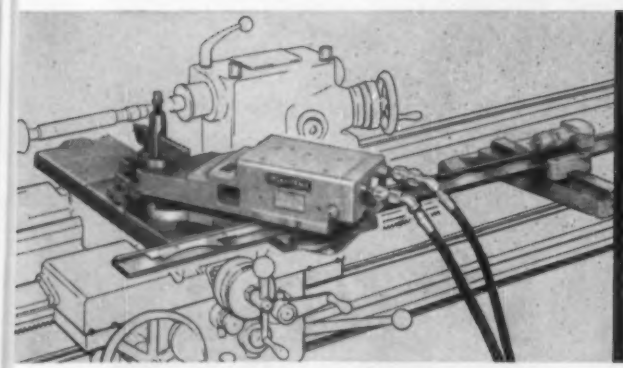
WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

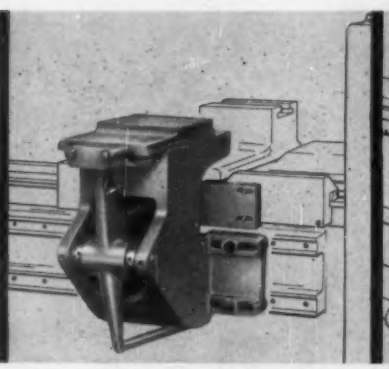
Another ALLNEW



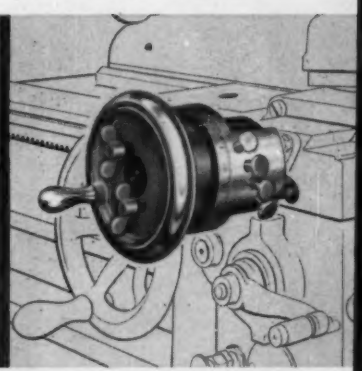
20″ Rapid Production Lathe



HYDRA-TRACE®. LeBlond's exclusive hydraulic duplicating attachment can be installed in minutes. For stepless form turning, contour facing, turning step shafts, etc **Transforms the Rapid Production into the most economical Tracing Lathe in its class!**

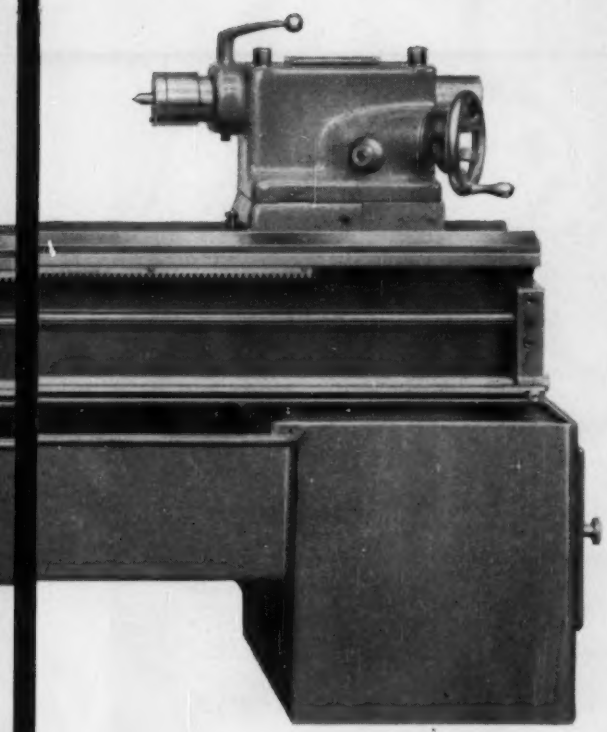


Automatic Facing Attachment. Permits two simultaneous operations from front and rear. While straight turning with front tools, attachment faces automatically using rear tools.



Multiple Positive Cross Feed Stops, Style B. Used for facing steps and duplicating diameter settings. Four adjustable stops are built into cross feed bushing. Will perform repetitive work accurately.

LeBLOND



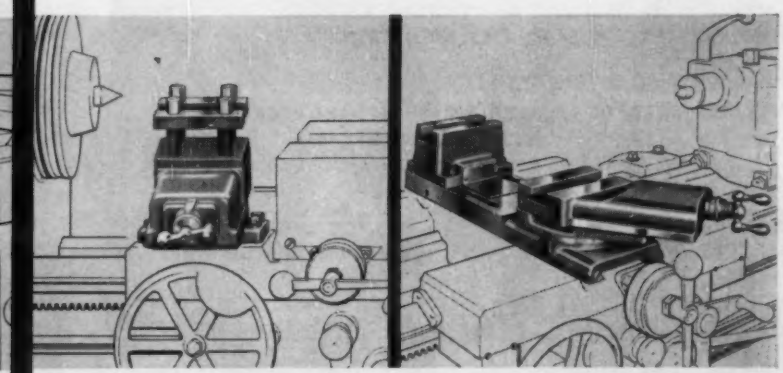
Low-cost manufacturing lathes with custom features to suit your specific turning jobs

Design your own manufacturing lathe—with the features and attachments you want. No extras to buy, only what you really need to do your job!

Here's how it works: The basic machine is either the new 17″ or 20″ LeBlond Rapid Production Lathe, designed from the ground up specifically for manufacturing assignments. They are *not* stripped down engine lathes. They *are* fundamentally simple, so that you can add the features you want. Ruggedly built, too, with all the basic LeBlond construction that assures dependable performance for many years.

From there on, it's your decision. First—your choice of speed ranges. On the 17″, 70 to 700 rpm or 105 to 1050 rpm. On the 20″, 57 to 600 rpm or 85 to 900 rpm. Next—your choice of any or all of these specific features: Hydra-Trace® hydraulic tracing, automatic facing, air-operated chucks, quick-acting tailstock, connected rests, taper attachments, turret tool post, cross and length stops, many more.

You'll find that with these custom features, you can design exactly the lathe you need to give you maximum production capacity per dollar investment. A lathe precisely suited to your manufacturing needs! Before you buy a manufacturing lathe, be sure to check the new LeBlond Rapid Production Lathes. Ask your LeBlond Distributor or write for Bulletin RP-220A.



Full Swing Rests. Makes full use of swing capacity over carriage wings for turning large diameter work. May be used with the compound rest for double-diameter turning on large gears, pulleys, etc.

Compound and Plain Connected Rest. Permits one-time set up for turning and facing step shafts. Rear facing tool operates alternately with front turning tool, without tool changing.

...cut with confidence

LeBLOND of Cincinnati

The R. K. LeBlond Machine Tool Company
Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes For More than 70 Years

Somebody did some power-ful thinking when they decided to LAPOINTE-BROACH the rack teeth and flat on this new POWER-STEERING PISTON

Sombody really had power on his mind, when determining that this newly-designed part, this power-steering piston, should be Lapointe-Broached on this machine which also has the power to drive down production costs. And it's not hard to drive down costs when you realize that you can get the rack teeth and flat completely broached at the rate of 192 parts per hour (at 80% efficiency) off *one* Lapointe Broaching Machine, with *one* operator.

That's truly power-ful production, indicative of the results that can be accomplished when Lapointe-Broaching is brought in on the job. No other metal-removing process could do this work *so fast.* No other process could do it *so well* — for the skill is all in the broaching tool, and rejects are eliminated.

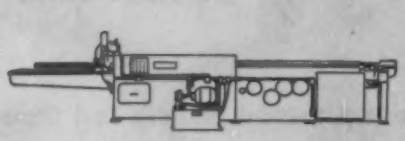
Lapointe-Broaching makes any man look good, who is responsible for production results. You may be doing yourself a big favor by asking one of the Lapointe Field Engineers to discuss *modern* broaching with you.

THE LAPOINTE MACHINE TOOL COMPANY

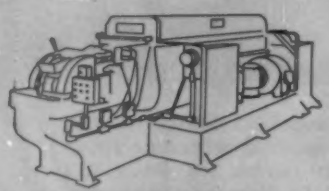
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

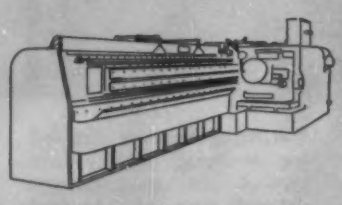
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



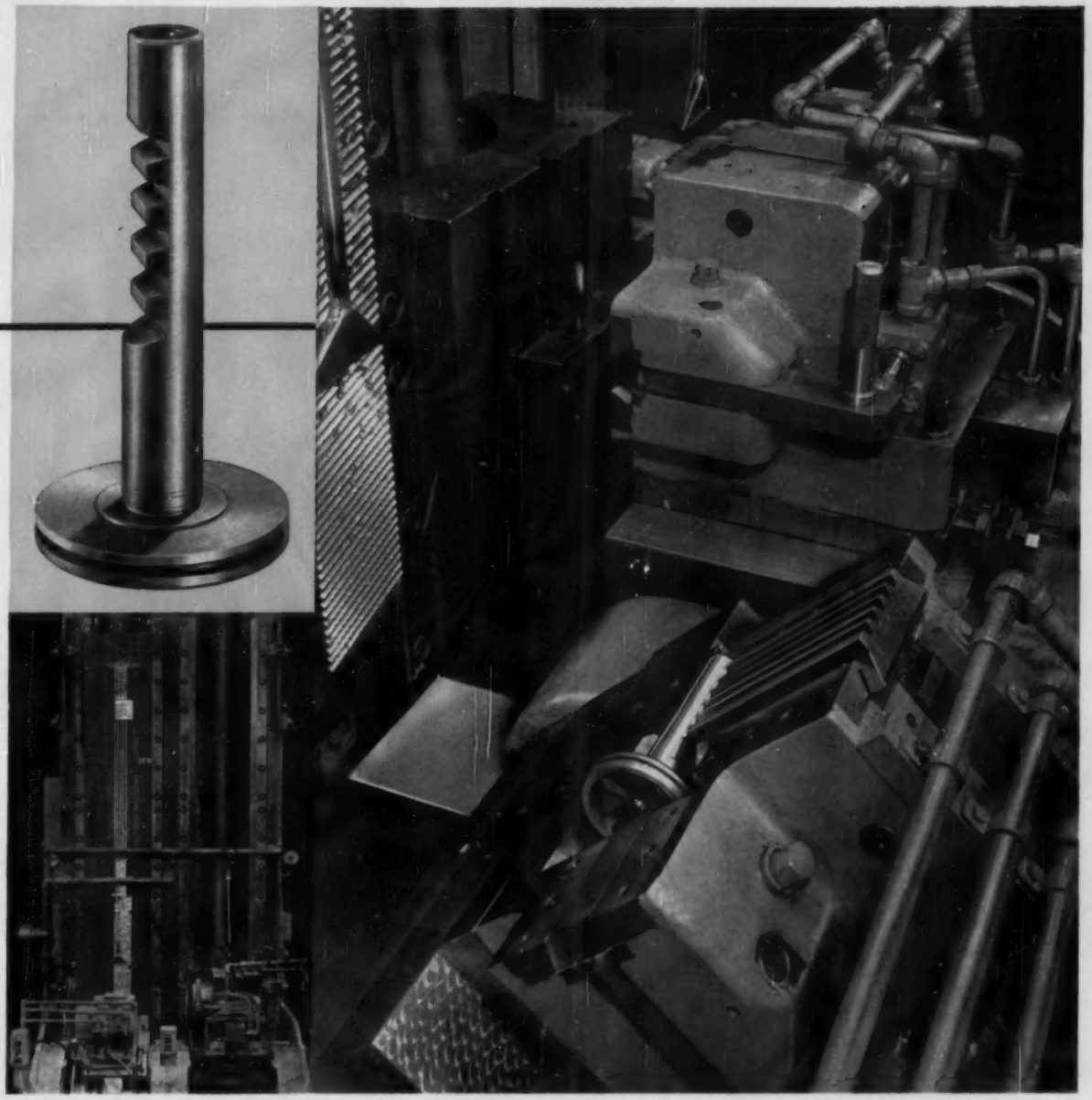
60" STROKE HORIZONTAL, ELECTRIC



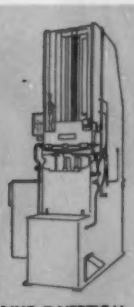
CH CONTINUOUS BROACHING, ELECTRIC



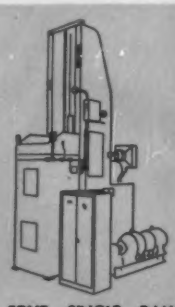
SRHE SINGLE RAM HORIZONTAL, ELECTRIC



This extremely efficient 15-ton Lapointe Double Ram Vertical Broaching Machine is built with 90-inch stroke. The patented Lapointe Tip-Down Fixtures have hydraulically operated automatic clamping which makes loading and unloading easy, and the electrical interlock of rams and fixtures assures fool-proof, safe operation.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC

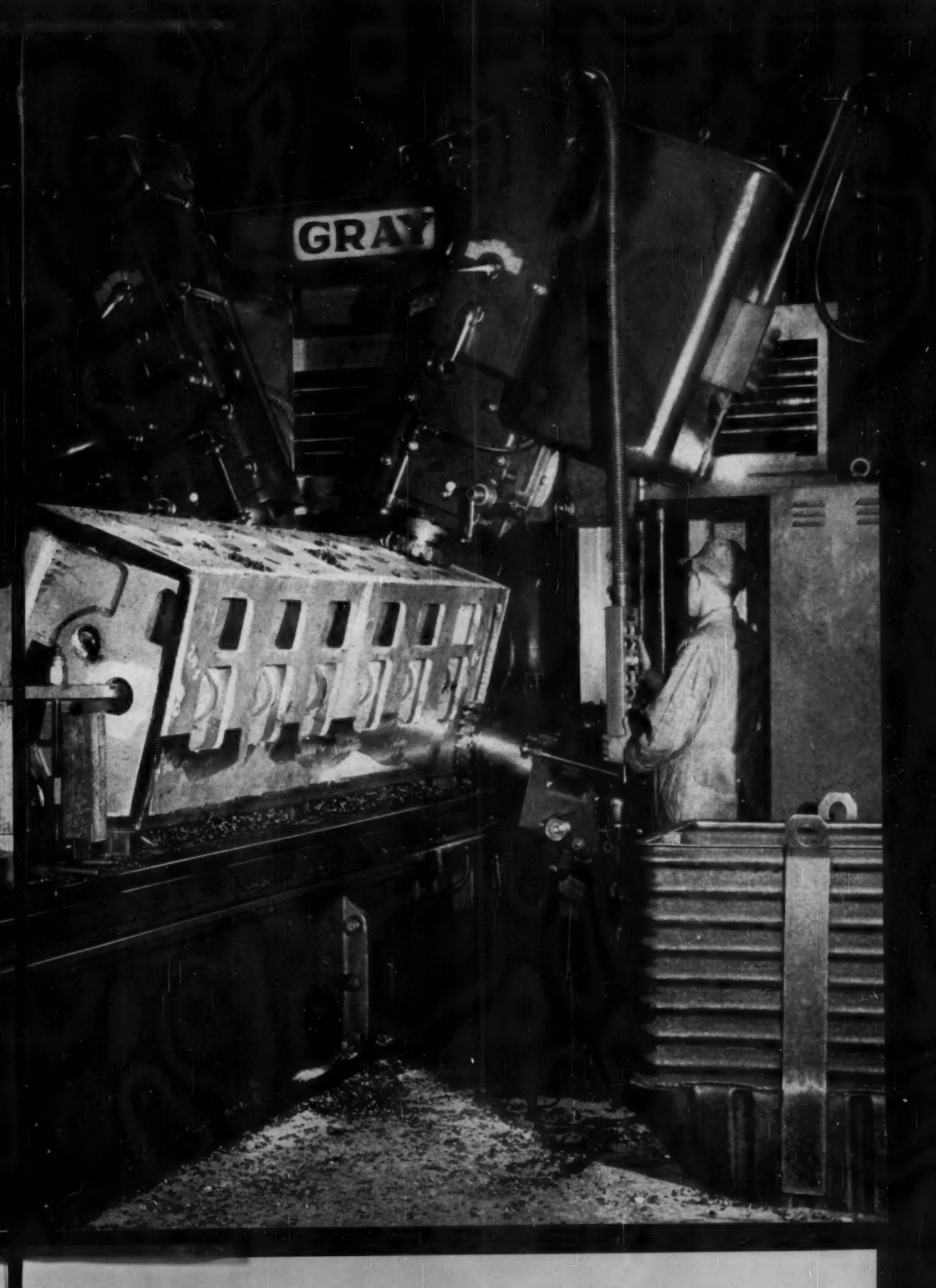
DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

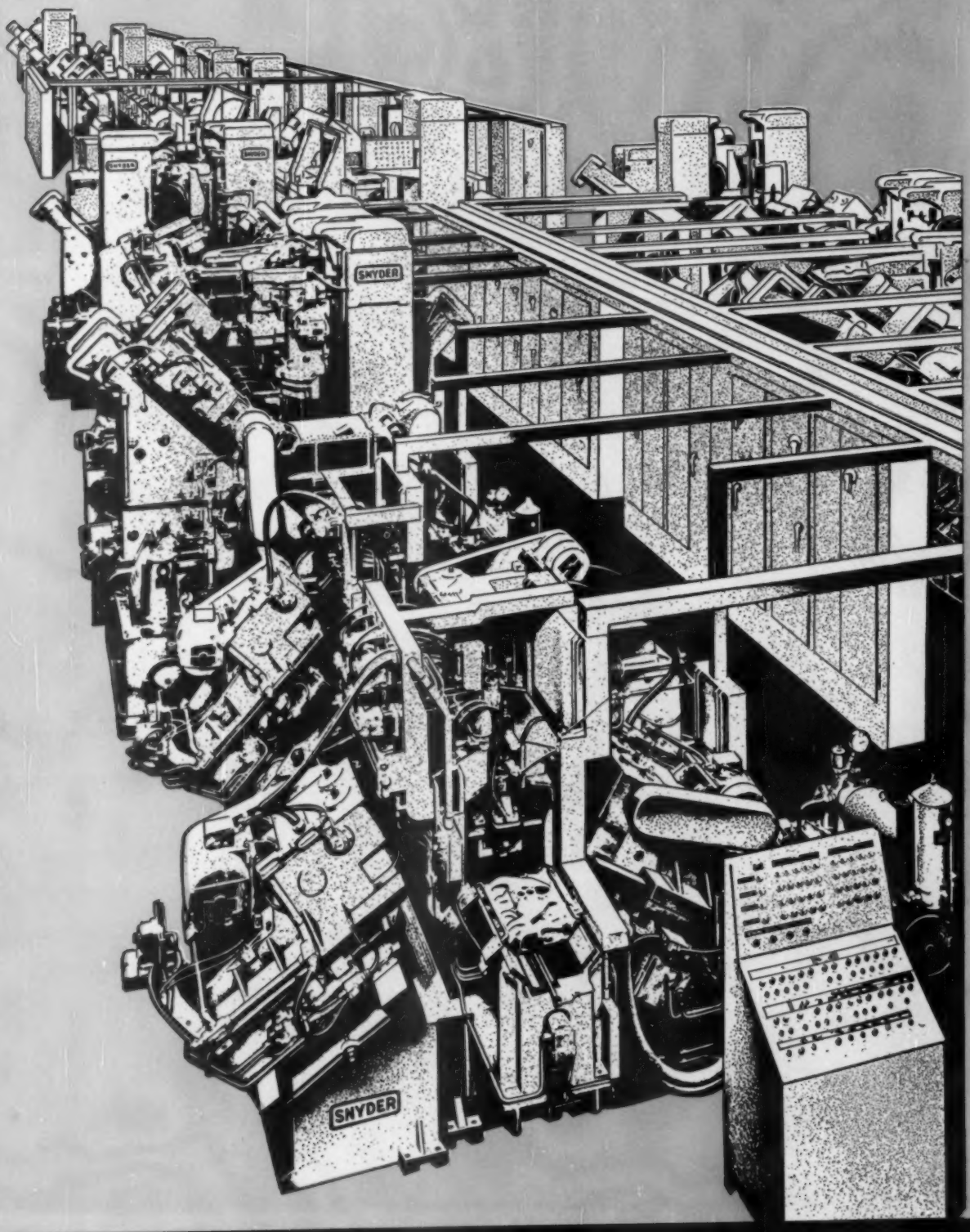
known to be the best in

BROACHING

Hungry heavyweight
The GRAY Miller has an enormous appetite for large jobs. Heavy feeds and big chips comprise the diet that satisfies the continuous hunger of this unit head giant.
All this combined with super precision and traditional dependability has established GRAY as the champion in the heavyweight field. When you feed your tough jobs to a GRAY Miller you'll see why . . .
Quality doesn't cost . . . it pays.
The G. A. GRAY Co., Cincinnati, Ohio


GRAY

Unique Combination of Snyder Special Two or Four Barrel Intake Manifold

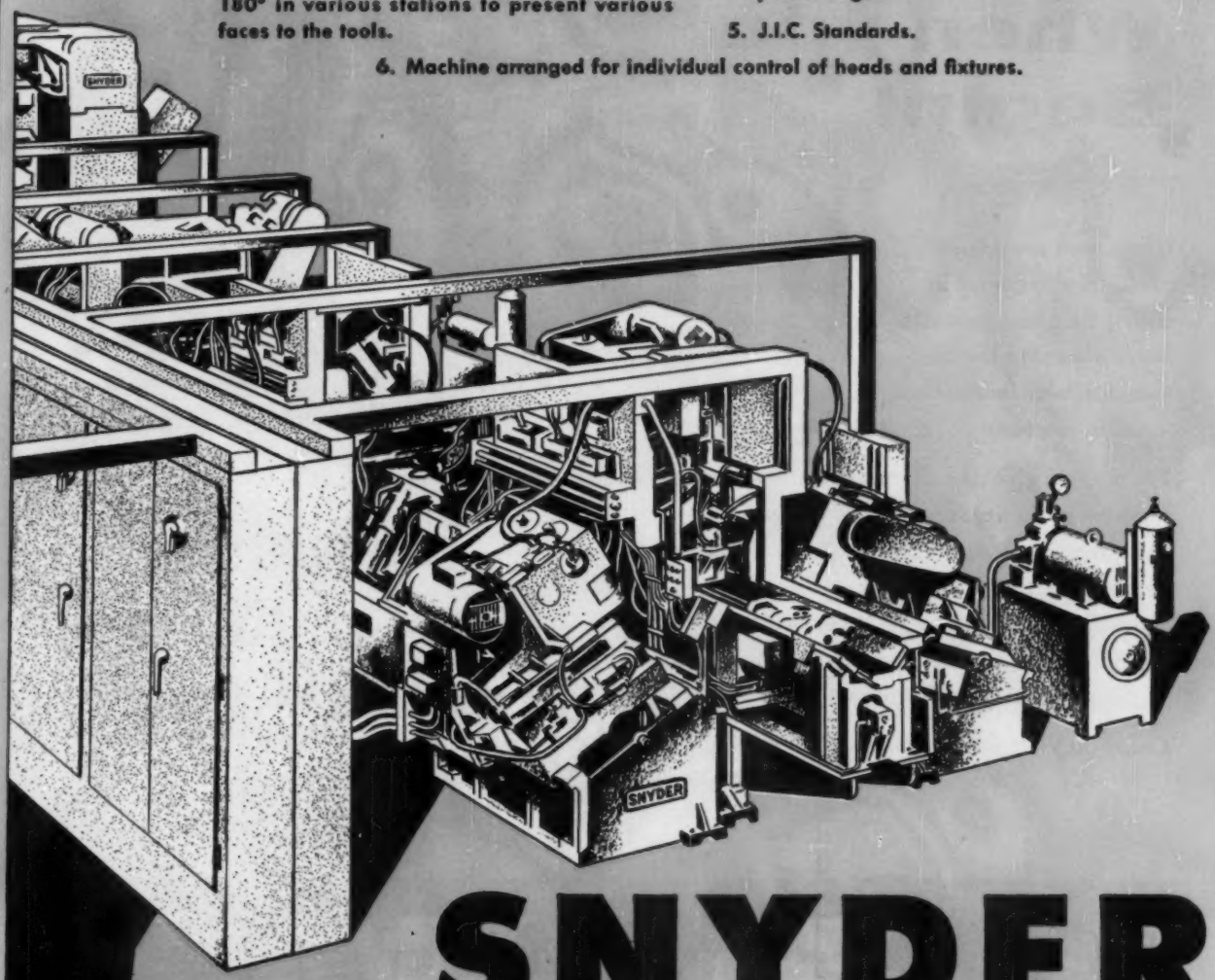


Transfer Machines Processes Either Castings from Rough to Finished Parts

Combination of two special transfer milling machines in parallel, with automation, feeding into one special transfer drilling machine gives production of 136 pieces per hour

Special Features of Snyder Machines Nos. 55-60 and 55-61

1. Machine line handles two or four barrel manifolds, random intermixed; sensing devices automatically instruct the proper drilling and tapping units.
2. Part rotated vertically 180° and horizontally 180° in various stations to present various faces to the tools.
3. Individual electrical panels and hydraulic units for each segment.
4. Wing bases, sections, spacers and risers standard throughout for easy adaptation to future part changes.
5. J.I.C. Standards.
6. Machine arranged for individual control of heads and fixtures.



SNYDER

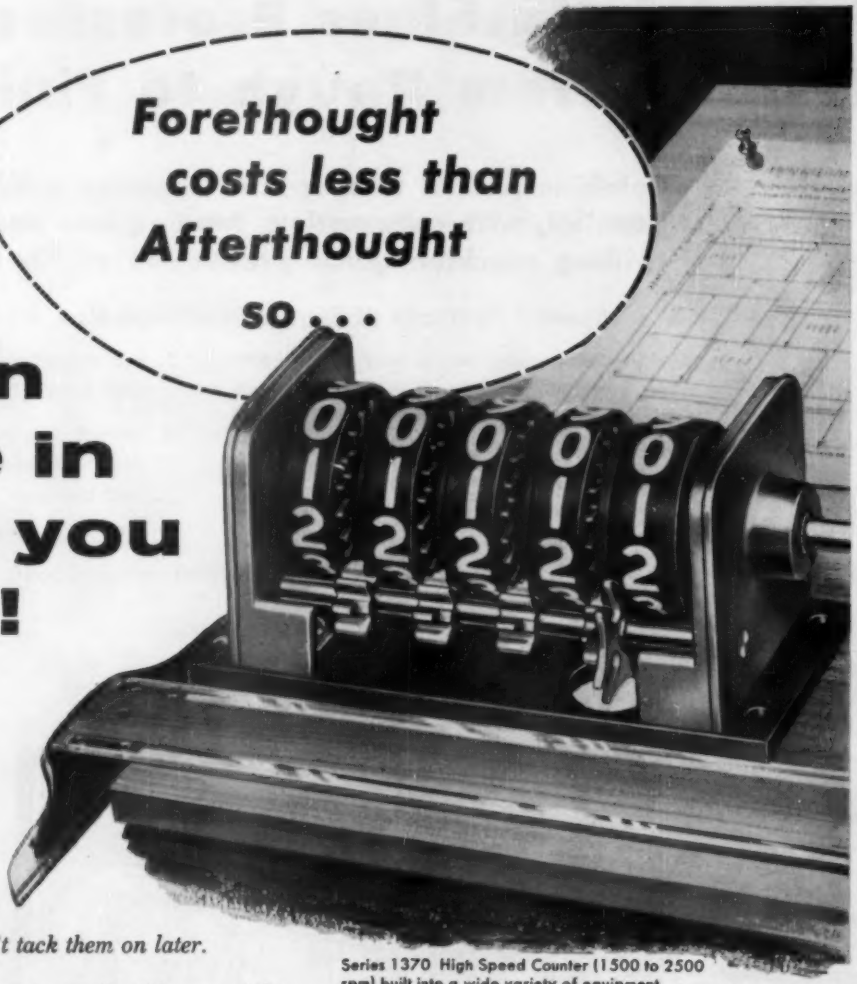
TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation

Forethought costs less than Afterthought so . . .

Design These in When you Begin!



Series 1370 High Speed Counter (1500 to 2500 rpm) built into a wide variety of equipment.

If you need mechanical or electrical counters in any of your new products, here's a word to the cost-wise designer: *Design them in, when you begin . . . don't tack them on later.*

For if you'll give us a chance to work with you, right from the beginning, chances are we can save you time and money by adapting or modifying a *standard* Veeder-Root Counter to your needs . . where you might get into a costly special job if you went about it alone. What's more, you save time in your engineering, purchasing and assembly departments.

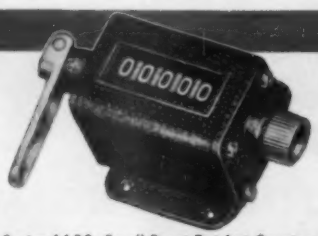
Count on Veeder-Root to help you in every way . . . from design to delivery. Write:

Everyone... Can Count on Veeder-Root

INCORPORATED

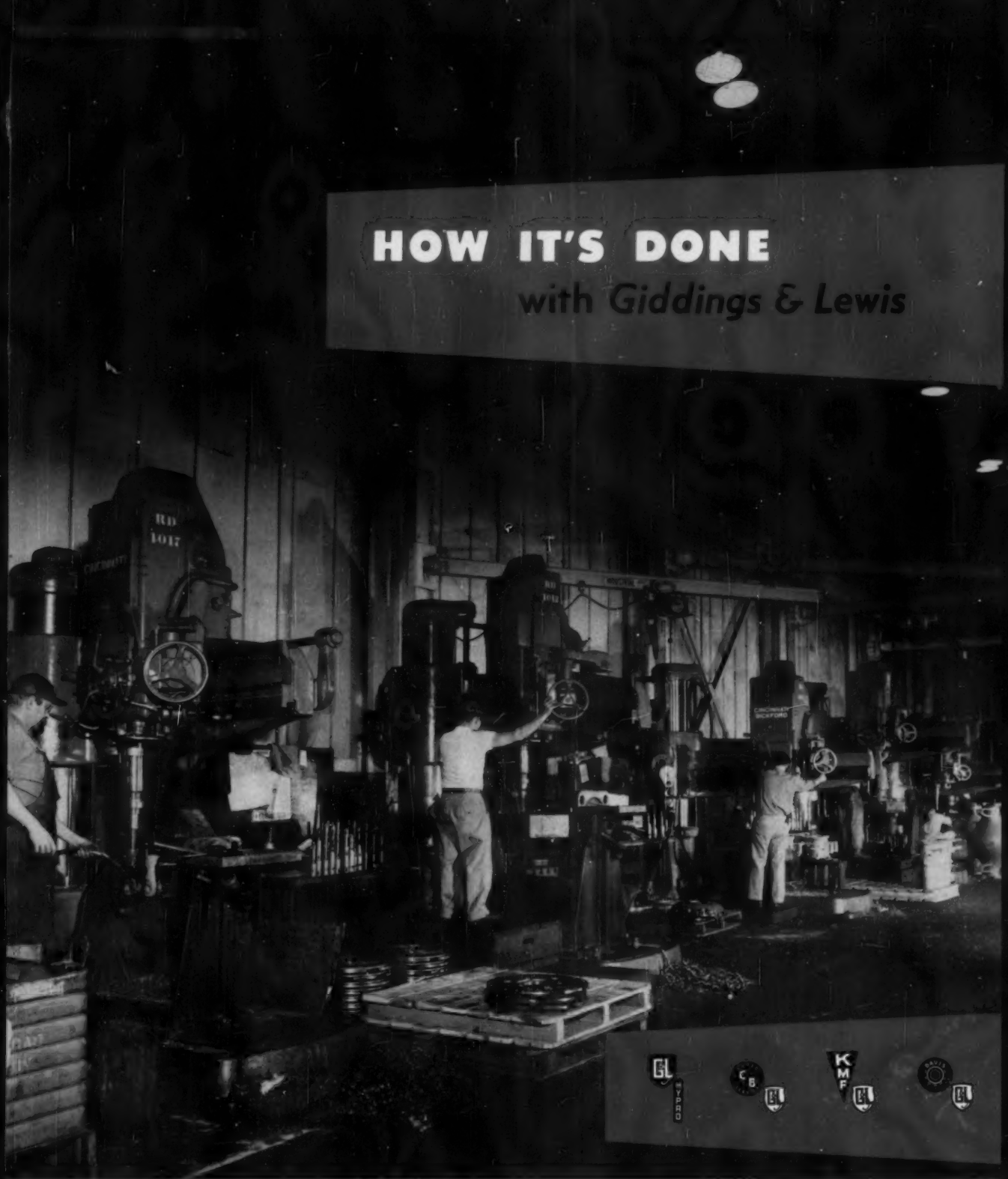
Hartford, Conn. • Greenville, S. C. • Chicago
New York • Los Angeles • San Francisco • Montreal
Offices and Agents in Principal Cities

Series 1205 Reset Magnetic Counter with panel mount and lock and key.



Series 1122 Small Reset Ratchet Counter.

Special Longitude Counter, one of many made for aircraft navigational equipment.



You're looking at a production line which consists of fifteen Cincinnati Bickford Super Service Radials (with 3′ to 6′ arms) that speed manufacturing operations of a leading earthmoving equipment line. Radials handle all boring, drilling, reaming, tapping and facing operations on rear axle housings, differential carriers, cylinder hoists, and other components for 7 to 25-yd. scrapers, rear-dump and bottom dump haulers, etc.

Here's a good yardstick for measuring production methods

Compare your own operations with these performance stories done on Giddings & Lewis machines . . .

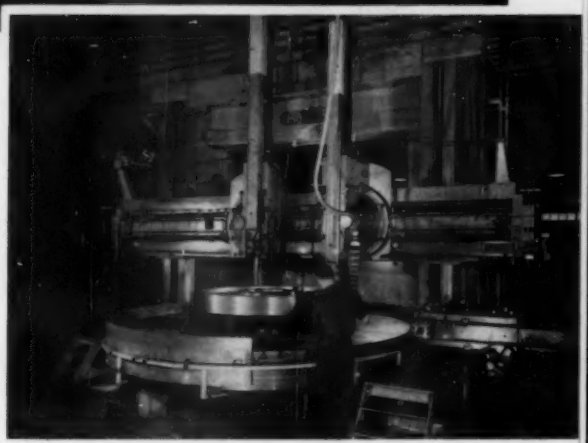
E. W. Bliss reports:
9 G&L machines
standout performers
producing metalworking presses...

They're counting on high-production G&L performance to build high-production mechanical and hydraulic presses at E. W. Bliss Company's Toledo Division. They're getting the profitable results they want with nine Giddings & Lewis machines.

Included are eight Horizontal boring, drilling and milling machines — two each of Models 350-T, 330-T and 360-F . . . one each of Models 560-T and 570-FUAR, and a 12-ft. Vertical boring mill.

Pictured above is a typical example of the precision machining performed on G&L machines. The Model 570-FUAR (floor-type) Horizontal with underarm support is being used for rough and finish line-boring of the cast-iron crown for a Bliss mechanical trimming press. Flanges and bearing seats are rough and finish milled on the G&L.

For complete specifications on G&L's broad line of heavy-duty machines, write for general Catalog No. 57.

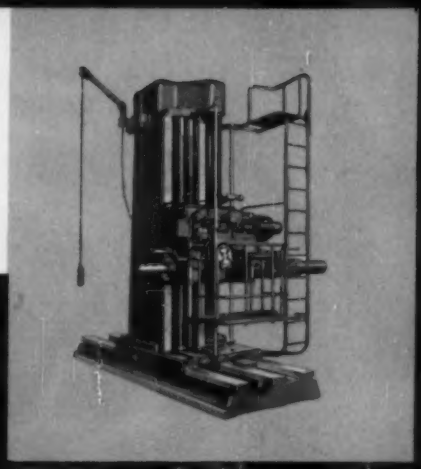


Shown here is the G&L 12-ft. Vertical boring mill being used to face, turn and bore various inside and outside diameters on the main driving gear blank of a Bliss mechanical press. Job is performed in one setup.

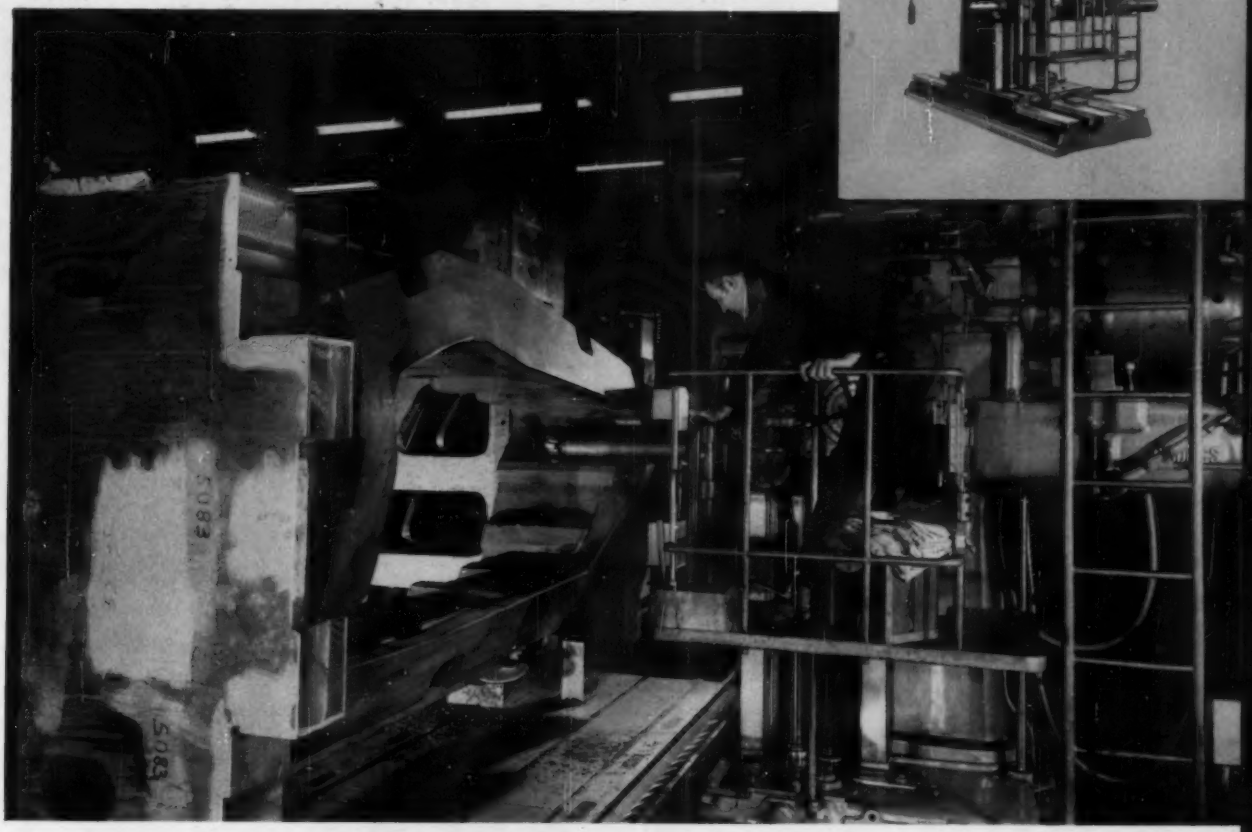
G&L HYPRO

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Milling Machines



At De Luxe Die Works this G&L Model 360-F (floor-type) Horizontal rough and finish-mills 13 large wear plate areas and 4 small keeper pads in upper die shoe with 8" dia. face mill. The 8½-ton die forms the left rear fender of a 1958 model car.



G&L dependability demonstrated at De Luxe!
precision machining fender dies...

Five G&L Horizontals work two shifts daily producing both large and small dies

"These G&L's are busy 18 and 20 hours a day," remarks Richard L. Dahl, shop superintendent at De Luxe Die Works, East Detroit, Michigan.

One of the largest automotive tool and die builders in the country, De Luxe precision-machines large and small dies on Giddings & Lewis Horizontal boring, drilling and milling machines. Dies are used in production of automobile quarter panels, hoods, deck lids, front and rear fenders.

The 8½-ton cast iron shoe (illustrated above) requires approximately 50 hours machining time on a G&L Model 360-F (floor-type) Horizontal with 6" dia. spindle. Thirteen large wear plates are rough and finish-milled using an 8" dia. face mill with high-speed cutters. All heels and safety pads are rough and then finish-milled.

Other G&L Horizontals include: Model 350-T (table-type) and a No. 56-T (table-type) with special attachment for profiling and contour milling of air-hardened steel dies. Smaller dies are bored, drilled and milled on two Giddings & Lewis No. 45-T (5" dia. spindle) precision horizontals. One is equipped with a 52" x 108" table, the other with a 40" x 84" table.

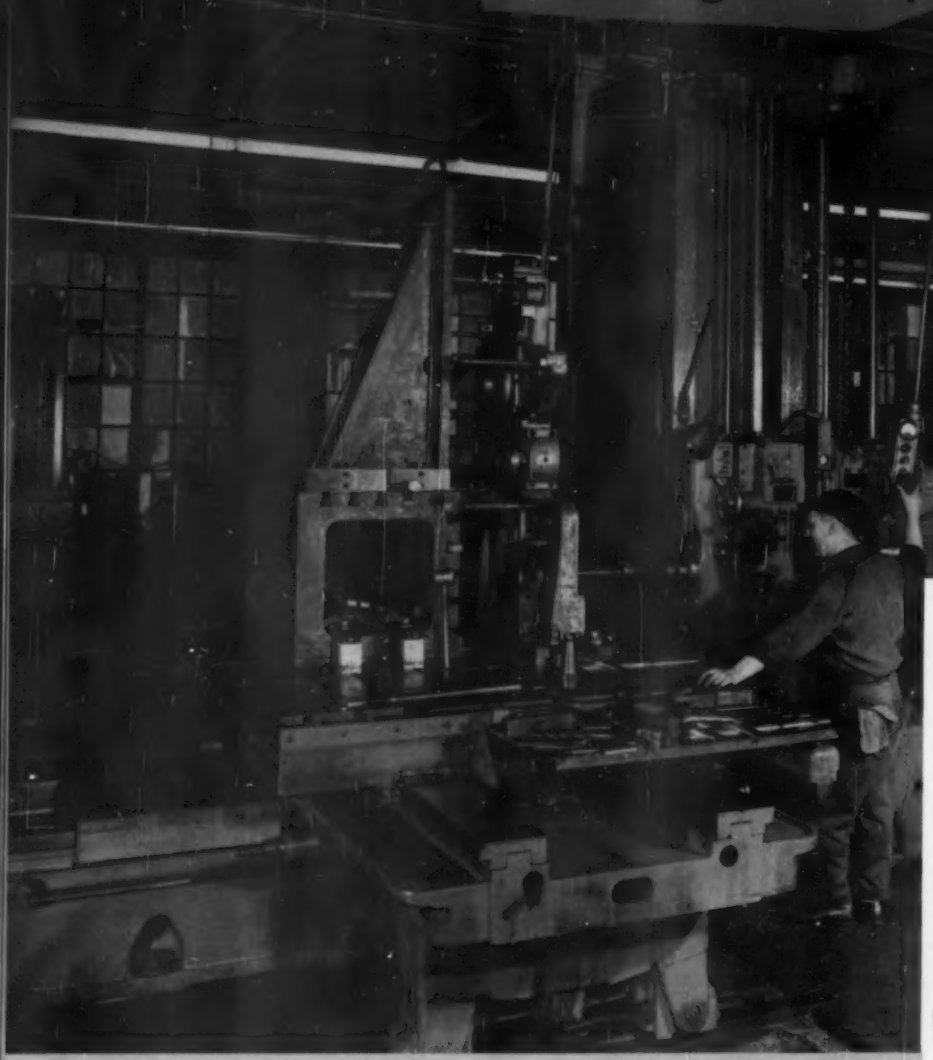
Model 360-F Horizontal is one of 24 Giddings & Lewis floor-type machines available with main spindle diameters from 5" through 14" — motor drives from 20 through 150 hp — larger machines available with underarm spindle support.

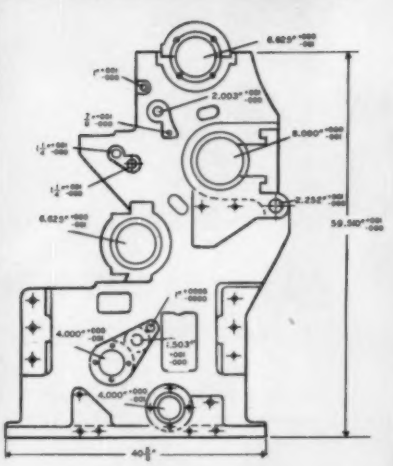
For complete specifications on the 30 Series (floor-type) Horizontal machines, see your nearest Giddings & Lewis representative, or write for Catalog No. 30-F.

G & L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Milling Machines.

HOW IT'S DONE
with *Giddings & Lewis*... building offset printing presses





Production sequence shown in pictures

Before machining starts, main frame for the offset press is squared vertically and horizontally on the table and with centerline of the machine spindle. Machine's automatic electric positioning device maintains tolerances and distances between centerlines of various size bores.

1. Two 6.625" bores for plate and impression cylinders — rough, semi-finish and finish-bored to .001" tolerance. Davis boring bar (4" dia., 10" long) and two-cutter blocks with expandable cutters used for rough boring at 102 rpm, .025 ipr feed.

2. The 8.000" bore for blanket cylinder — rough, semi-finish and finish-bored . . . also back-faced with a Davis 11.125" facing cutter. Rough boring is with a Davis block-type cutter at 89 rpm, .025 ipr feed.

3. This 2.003" hole is drilled first with a 1" drill and then with a 1⅛" drill before it is rough, semi-finish and finish-bored. Rough boring is accomplished with a Davis block type cutter at 329 rpm, .025 ipr feed.

Unwavering precision

...key reason why Harris-Seybold's Cleveland Division makes wide use of Davis standard tools on precision bearing operations

High product quality has made Harris-Seybold, Cleveland, a recognized leader among makers of offset lithographic presses. Use of Davis boring bars and cutting tools at the company's Cleveland Division, where the largest presses are made, is in keeping with this reputation.

Davis block-type general purpose boring bars with interchangeable cutter blocks are used for *virtually all* precision boring operations on press main frames. Machinists report Davis block type cutters last longer, require far less frequent sharpening. They're pleased, too, with the fact that Davis carbide cutting tools are ideal for high speeds and feeds.

Shown at left is the machine on which these standard Davis boring tools demonstrate unwavering precision. It's a Giddings & Lewis Model 350-T (table-type) Horizontal with 5" spindle, 60" x 96" table, 120" bed, extended saddle and saddle supports, in-the-floor type auxiliary runways. Its automatic electric positioning device ends time-consuming fine hand adjustments . . . permits automatic setting of headstock and table . . . assures accurate, repetitive machine settings to .0002"

19 Giddings & Lewis machines contribute to Harris-Seybold quality

In addition to the Model 350-T Horizontal described above, there are *five* Cincinnati Bickford 4-spindle 24" Super Service gang drills . . . *one* 24" round column upright . . . *two* 3'-11" radial (12-speed head) . . . *two* 4'-11" radial (36-speed) . . . *three* 6'-19" radials . . . *one* 5-spindle upright . . . *one* Model 330-T and 50-T Horizontal . . . *two* HYPRO planer-millers (84" x 84" x 16').

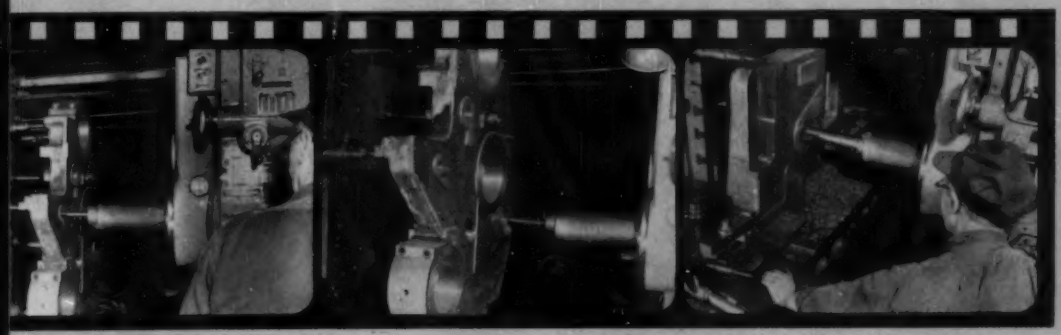
You'll find the boring tools you want in the complete Davis line. See your local Davis sales representative or write for Catalog No. 304.

DAVIS BORING TOOL DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Line and Stub Boring Bars, Boring Heads, Block Type Cutters, Planing and Turning Tools, and Special Production-Engineered Job Tooling.

Choose from the complete Davis line of standard boring, turning and planing tools . . .

Extension Boring Head
Stub Boring Tools with Unfinished Shanks
3 and 1 Boring Head
8-Position Tool Holders
L-Type Boring Tools
Line Boring Bar with 3 and 1 Boring Head
Quick Change Arbor and Sleeves
Interchangeable Block Type Tooling
Carbide Tip Planer Tools
Micrometer Adjustable Stub Boring Tool Set
"Tap-Saver" Tapping Heads with Automatic Torque Control



Davis production-engineered tooling designs . . .

Special spherical boring tool designs are typical of Davis custom tooling service. Feel free to call on us for special-design solutions to your machining problems.

4. This 1¼" hole is drilled — rough, semi-finish and finish-bored. Rough boring is with Davis block type, double-tip cutters at 375 rpm, .025 ipr feed.

5. This 2.252" hole is drilled — rough, semi-finish and finish-bored. Rough boring is with a Davis two-cutter block with expandable cutters at 329 rpm, .025 ipr feed.

6. Two 4.000" holes are finish-bored to plus .000", minus .001" with Davis two-cutter block with expandable cutters at 160 rpm, .025 ipr feed.

HOW IT'S DONE with Giddings & Lewis

machining dies in East Detroit...

Intricate, precision die machining operations profitably handled

Giddings & Lewis Model 340-T (table-type) Horizontal pays its way with precision performance at Supreme Impression & Mold Co.

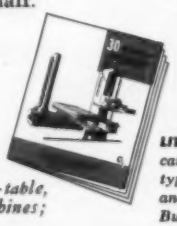
Supreme is one of America's major die-cast die producers. The company's precision-made products are used in casting magnesium, aluminum and zinc components for the automotive and appliance industries.

Pictured at work below is Supreme's G&L Model 340-T (table-type) Horizontal boring, drilling and milling machine — 4" diameter spindle, with 48" x 72" table, 48" column, extended saddle and saddle supports, in-the-floor auxiliary runways. Workpiece in a cover-half die to be used for casting TV-receiver screen frames. Weighing approximately 2500 lbs, the die is Crucible CSM-2, preheat treated to 280-310 Brinell. The G&L Horizontal removes more than 300 lbs. of metal in the following production operations:

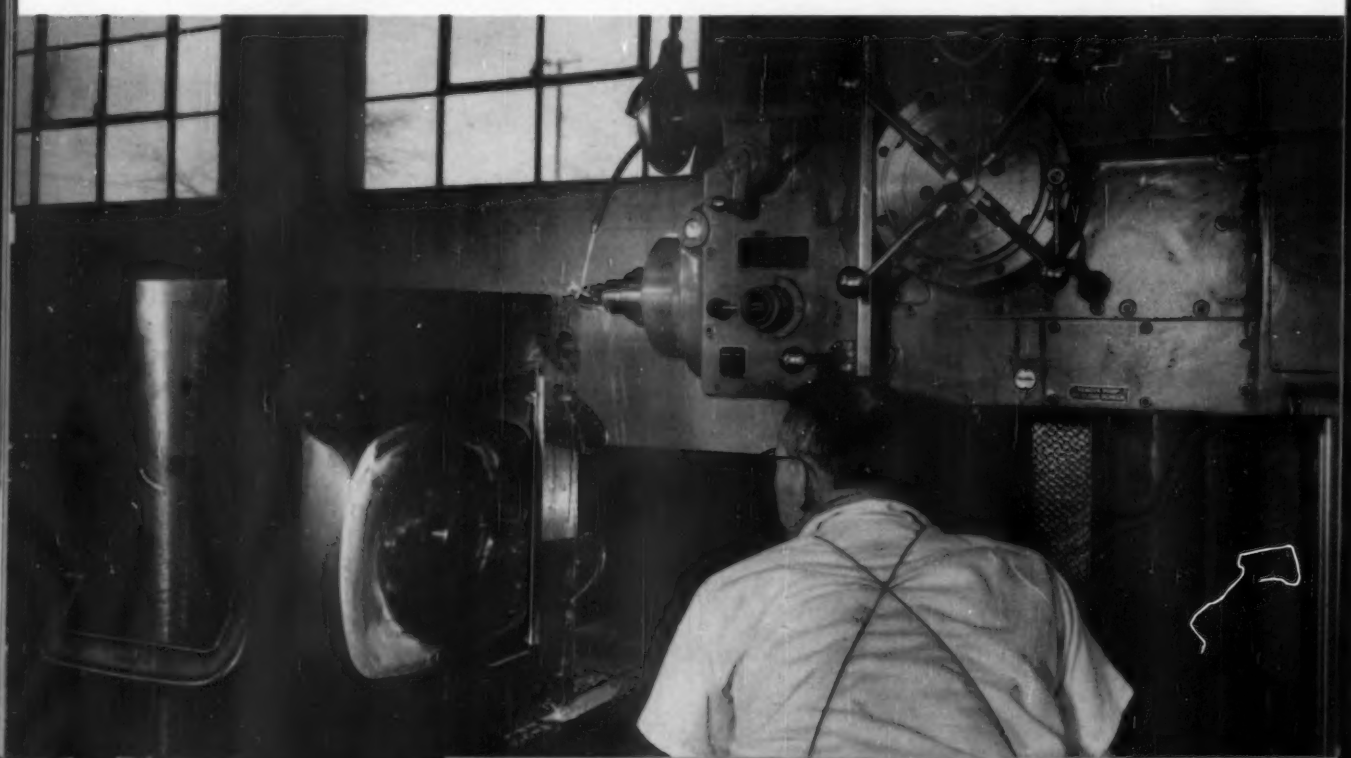
1. Die edges rough and finish milled using 14" face mill with ten high-speed cutters. Finish cuts at 20 rpm, .010" feed per tooth.
2. Clamp slots milled and eye-bolt holes bored. Four 2½" leader-pin holes precision drilled, bored and reamed (bushings also precision bored).
3. Ejector plate and rails are face-milled with an end mill.
4. Ten core pin holes of various sizes are precision bored.
5. The 2" sprue pin hole is bored . . . taper-reamed on the cover-half of the die, straight-bored on the ejector half.
6. Four corners of cover-half is radius-milled with an end mill.
7. Sixteen water line holes of various sizes (30" to 34" deep) drilled, reamed and pipe-tapped in both cover-half and ejector half.

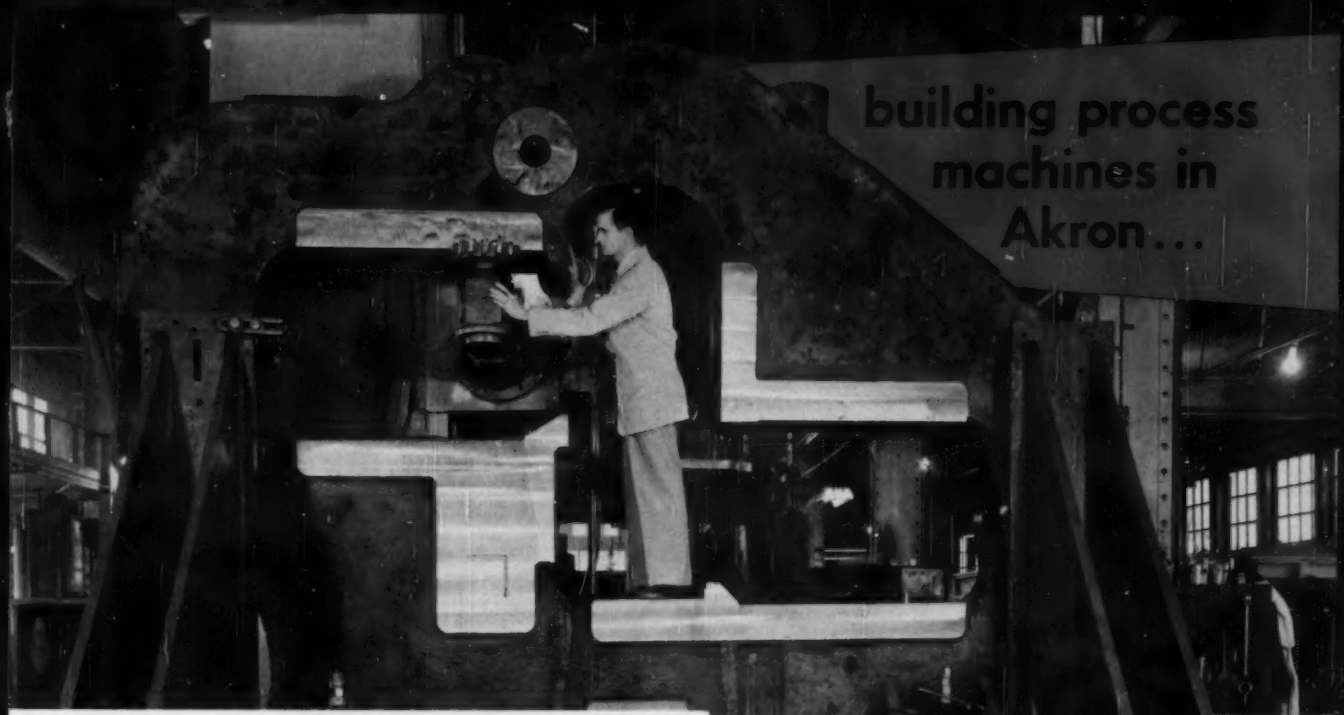
G&L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Machines.



LITERATURE! *For complete specifications on G&L 30 Series (table-type) horizontal boring, drilling and milling machines, ask for Bulletin No. 30-T.*





All window surfaces of this huge casting are rough and finish-milled to exact tolerances on G&L's 570-T (table-type) Horizontal. Use of 90° angular milling attachment greatly reduces number of setups required . . . simplifies machining of hard-to-reach surfaces.

Extra measure of power, speed and precision

That's what makes a G&L 570-T (table-type) Horizontal one of the busiest and most productive machines at Adamson United Company

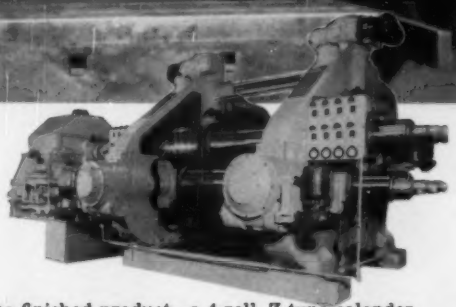
This Akron, Ohio, company is an important producer of basic and special process machinery for rubber, plastics, plywood, chemical and other industries.

Metalworking production engineers at Adamson United are enthusiastic about the performance they're getting from their Giddings & Lewis Model 570-T (table-type) Horizontal with 7" spindle. Working on both horizontal and vertical surfaces, the G&L is shown above precision-machining on a 14-ton side-frame casting of a calender.

Equipped with a G&L 90° angular milling attachment, the Model 570-T is used to machine all window surfaces of the calender housing in a single setup. And equipped with the same angular attachment with stub boring bars, it is used for boring adjusting-screw and tie-bolt holes. Then, with the workpiece in horizontal position on the 60" x 96" rotary indexing table, further rough and finish boring is performed . . . and all external faces (not machined in vertical position) are faced to exact tolerances and angularity.

For complete specifications on G&L 50 Series Horizontal boring, drilling and milling machines, write for Catalog No. 50-T.

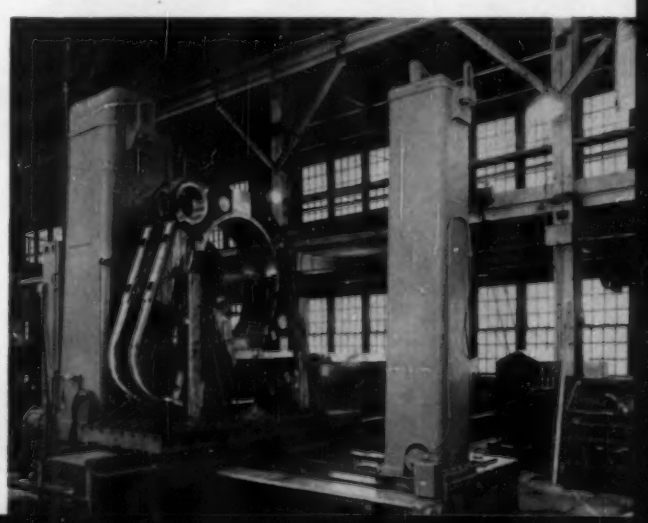
The Giddings & Lewis Model 570-T shown has continuous feed facing head and telescopic tool. It is shown precision boring a 65" dia. half-hole in two housings, set up side by side. All smaller boring operations are performed with Davis micrometer bar sets and block-type cutters.



Here's the finished product—a 4-roll, Z-type calender. Each of its 14-ton cast-iron end frames is precision-machined on the G&L (table-type) Horizontal.

G & L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

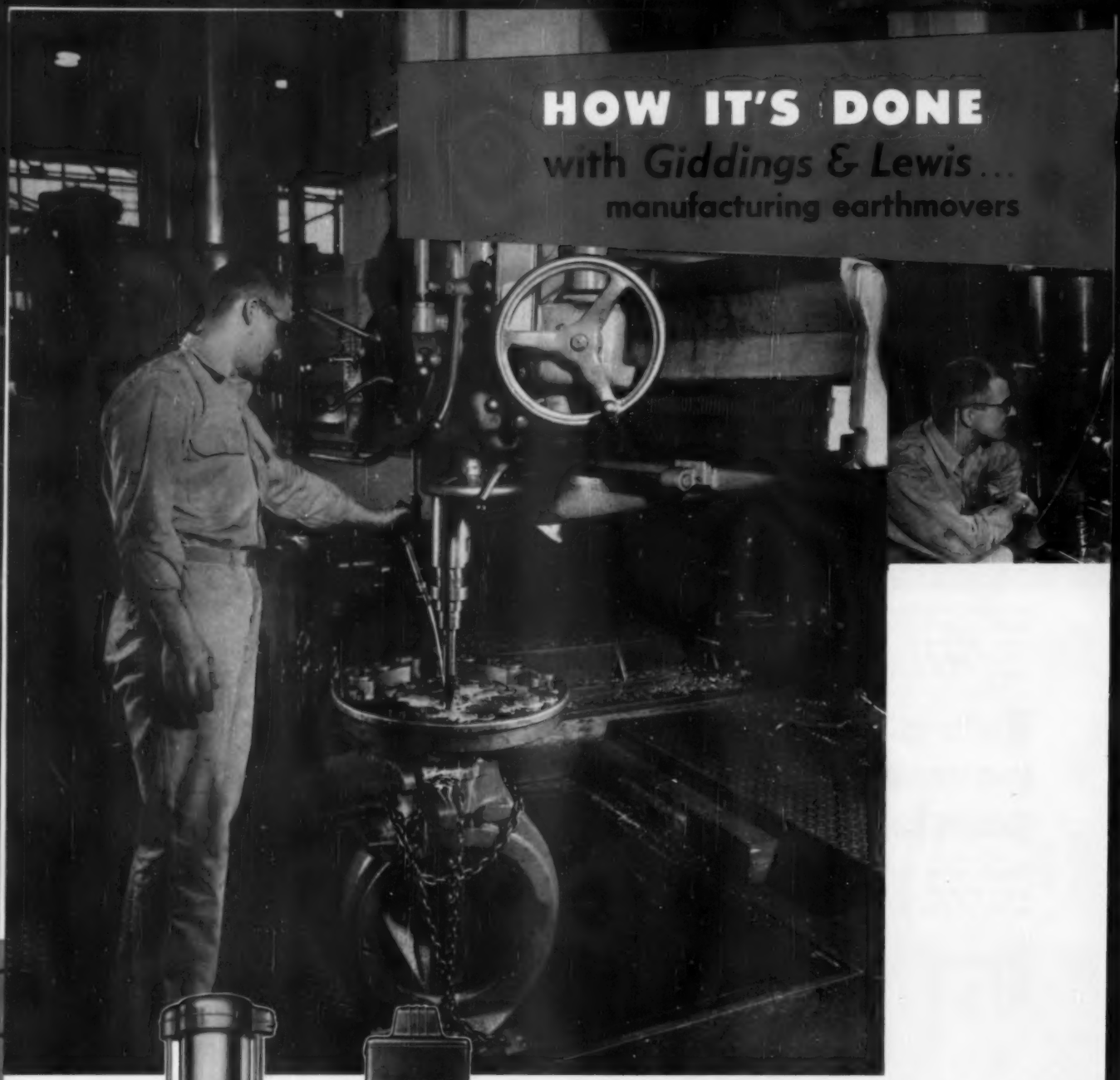
Builder of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Milling Machines.



HOW IT'S DONE

with *Giddings & Lewis*...

manufacturing earthmovers



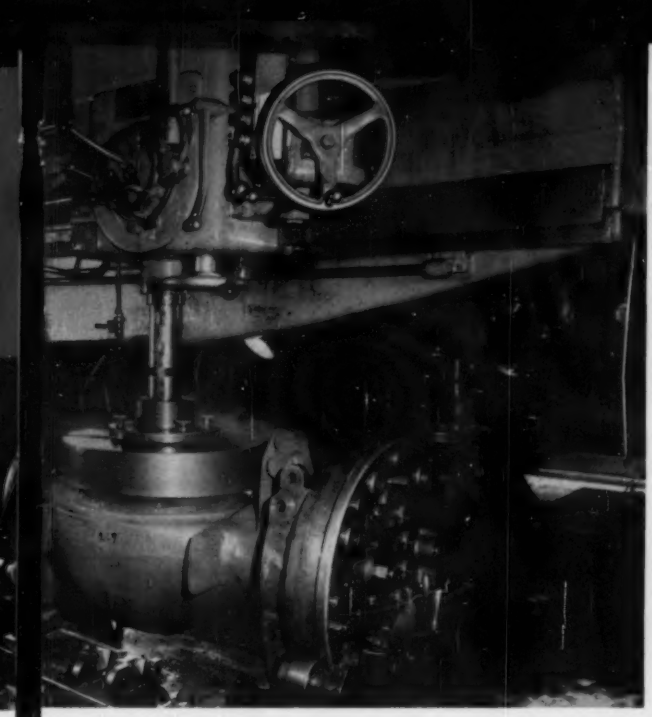
▲ Special pit is used for positioning rear axle housing. Promotes fast, accurate drilling, tapping, core drilling and countersinking of various diameter holes. Note use of special drilling template with pilot bushings.

Super Service Radials with complete hydraulic pre-selection of 36 speeds, 18 feeds

Only a turn of the dials and all 36 spindle speeds and 18 feeds are hydraulically pre-selected while the spindle is running in either forward or reverse, or when stopped.

These new type Radials are available in sizes from 13" column, 4' arm to 19" column machines with 8' arm. Latest design developments assure fast, accurate drilling, boring, tapping, facing and reaming of materials ranging from tough alloy steel through cast iron to aluminum.

Super Service Radials are also available with special bases and tables to meet your specific work requirements.



Here a specially designed spread facing head with single carbide tip cutter is being used for rough and finish facing of differential. Finish facing cut is performed at 245 rpm, .020″ feed.

Fifteen Radials, with spindle speeds to 2300 rpm, used for drilling, tapping, reaming, facing, boring of rear axle housings, differential carriers and other vital earthmover components

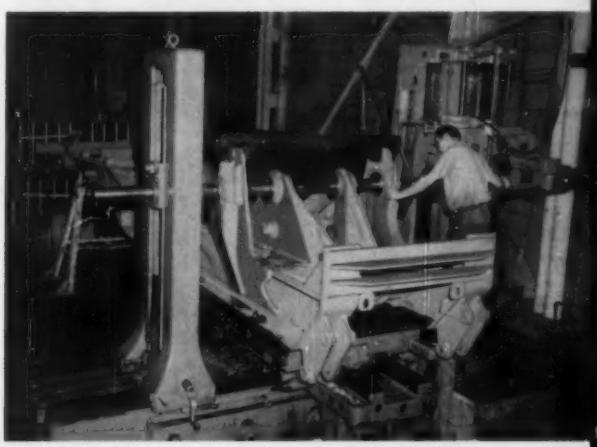
Proving their versatility on every production drilling job — these easy-to-operate Super Service Radials are key machines in the Cleveland plant expansion program of this industry leader. Company produces earthmovers for road-building and other projects —scrapers, rear-dumps and bottom dumps, ranging from 7 to 25-cu. yd. capacities.

In operation for more than nine years, the fifteen Cincinnati Bickford Radials with 3′ to 6′ arms (36 speeds, 18 feeds) have been the answer to increased production drilling. They are used with drill jigs to eliminate need for lengthy layout setups.

Super Service Radials
demonstrate production drilling versatility

Here's typical production sequence in facing, drilling and tapping a heat-treated, cast-steel, 247-287 Brinell, 1000-lb rear-axle housing:

1. With workpiece clamped in an indexing trunnion fixture, four 1 1/64″ and seven 1″ holes are drilled and reamed on both flanges.
2. Differential mounting is rough and finish faced, using spread facing head with single carbide-tip cutter. Finish cut faced at 245 rpm, .020″ feed.
3. Rough and finish 19 1/8″ dia. differential bore at 52 rpm, .006″ feed, .003″ tolerance.
4. Twenty-two .553-.556″ holes are drilled, tapped, core-drilled and countersunk on differential face.
5. Using jig fixture, ring gear clearance is cut with core drill. Six 35/64″ holes are drilled in air chamber bracket.
6. Eleven different-sized holes are drilled for spring and radius-rod assembly.
7. Eight 3 1/2″ holes for spring bolts are spot faced at 85 rpm hand feed.



Another versatile machine in earthmover production — G&L Model 340-T (table-type) horizontal boring, drilling and milling machine

The Model 340-T with 4″ dia. spindle, 48″ x 72″ table, performs rough, semi-finish and finish-precision boring of rear-axle, tandem-drive assemblies.

Four 6 3/4″ dia. holes, spaced 12″ apart, are precision bored to plus or minus .001″. Mutual alignment of four bores must be practically perfect.

Providing for even greater machining possibilities, the Model 340-T is equipped with extended saddle and saddle supports, in-the-floor auxiliary runways, 36″ x 36″ indexing table, continuous feed facing and boring head, Davis boring bars and cutting tools.

Get all the facts about Super Service Radials featuring complete hydraulic pre-selection of all 36 speeds and 18 feeds. Contact your nearest Cincinnati Bickford representative or write for illustrated bulletin.

CINCINNATI BICKFORD DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
CINCINNATI, OHIO

Radial Drilling Machines, Upright Drilling and Tapping Machines, Gang Drills and Precision-Drilling Machines designed for use with Spacing table.

HOW IT'S DONE
with *Giddings & Lewis* ... contouring tire molds

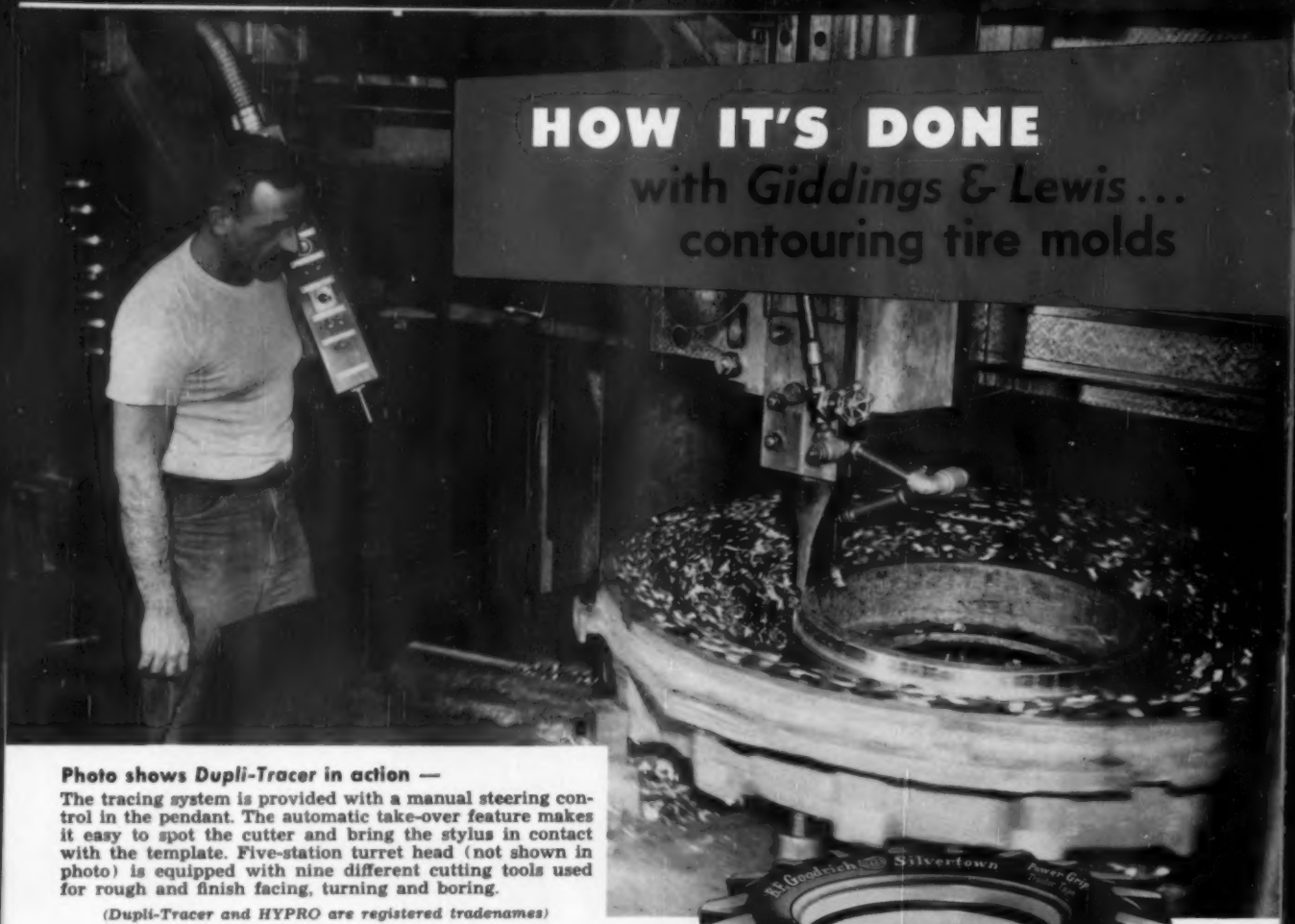


Photo shows *Dupli-Tracer* in action —
The tracing system is provided with a manual steering control in the pendant. The automatic take-over feature makes it easy to spot the cutter and bring the stylus in contact with the template. Five-station turret head (not shown in photo) is equipped with nine different cutting tools used for rough and finish facing, turning and boring.

(Dupli-Tracer and HYPRO are registered tradenames)

Minimize chance for human error in mold contouring!

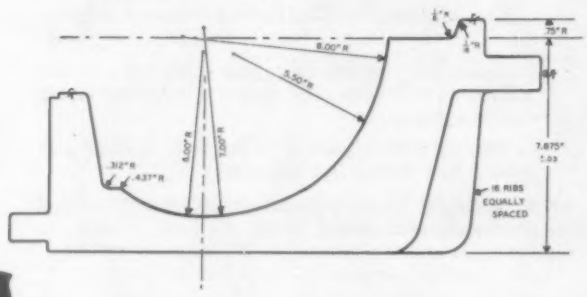
B. F. Goodrich does it! Uses *Dupli-Tracer*, 2-dimensional electronic contouring control, on a G&L 8-ft HYPRO Vertical boring mill

They're enjoying a greater measure of accuracy — virtually complete freedom from human error — contouring tire molds at B. F. Goodrich in Akron, Ohio. This money-saving performance is credited to Gidding & Lewis 8-ft. HYPRO Vertical boring mill equipped with the electronic contouring control.

Equipped with a tracing head, this control assures precision contour-duplication of various radii and diameters from a master template. Constant chip thickness and constant cutting speed are maintained to produce a surface which is finished velvet smooth for tire-cure.

LITERATURE AVAILABLE! *For all the facts about the ultra-sensitive 2-dimensional tracing and duplicating control — and specifications about HYPRO Vertical boring mills, see your G&L representative, or write for Catalog No. 64-12.*

The B. F. Goodrich tractor tire shown here is typical of the products cured in tire molds which are precision-machined on the G&L 8-ft HYPRO Vertical. Drawing below shows the degree of contouring required on (female) upper half of mold.



G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Milling Machines

....machining automotive dies and molds

G&L Horizontal steps up production to help meet 50% sales boost at Loehr Die & Mold Company

It's a Model 300-T (table-type) Horizontal boring, drilling and milling machine with 3" dia. spindle, extended saddle and saddle supports, in-the-floor type auxiliary runways

THIS East Detroit specialist in precision-machining of die-cast dies, plastic molds, cavities and die engravings for automotive and other industries expanded production to meet soaring demand . . . purchased a Giddings & Lewis Model 300-T Horizontal.

Simplicity of operation is assured with controls centrally located on the headstock for speed and accuracy. Forty-five spindle speeds, as low as 7 rpm, enables the operator to use the Horizontal as either a small or large milling machine for intricate precision die work. Additional advantages hailed by Loehr are the machine's full-length scales and verniers which permit locating hole centers to .001".

(Also on the job at Loehr Die & Mold Company, is a Super Service Radial with 5-ft. arm and 15" dia. column)

Here's a typical machining sequence:

Workpiece shown on Loehr's G&L 300-T Horizontal is a die-cast die block (40" x 42" x 6") which, when machining is completed, will be used in production of glove compartment doors for a brand new line of 1958 cars. Made of heat-treated steel with Rockwell hardness C 30-32, the die block weighs approximately 1.7 tons before machining . . . must have 417 lbs. of steel removed.

1. Outer surfaces are milled with 8.5" dia. high-speed steel face mill.

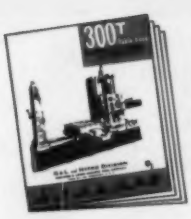
2. Pockets roughed out (upper and lower half of die block) by manual steering made possible by directional control with a 2" dia. end mill at 60 rpm, .83 ipm feed and average 1¼" depth of cut.

3. Four 2" dia. guide pin holes and bushings, 2" dia. sprue pin and bushing hole—rough and finish bored.

4. Pockets and inserts for the die are finish milled, holding plus or minus tolerances of .002".

5. Eight water line holes are drilled (7/16" dia., 15" long).

6. Workpiece is then moved to Loehr's Cincinnati Bickford Super Service Radial which is used for drilling and reaming several ¼" and ⅜" dia. ejector pin holes . . . drilling and tapping four ¾" dia. push back holes.



For complete specifications on G&L Models 300-T and 300-RT (revolving table-type) Horizontal boring, drilling and milling machines, contact your nearest G&L representative or write for catalog No. 300-T.

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double Housing and Openside Planers, Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

HOW IT'S DONE

with *Giddings & Lewis*... precision drilling for

Drilling, tapping on angular column workpiece of SAE-1020 steel:

1. Drill one $2\frac{15}{64}$" hole.
2. Drill ten $1\frac{1}{16}$" holes.
3. Drill one ¾" hole, core drill $2\frac{1}{2}$" dia., core drill to $3\frac{3}{4}$" diameter.
4. Drill and tap fourteen ⅞" leveling screw holes.
5. Drill ten ⅜" holes and tap .9" deep.
6. Drill six $1\frac{3}{16}$" hold-down holes.
7. Drill four ¼" holes and tap .6" deep.

This Cincinnati Bickford Super Service Radial, (6-ft. arm, 19" dia. column) on 16-ft. dia. round floor plate, is used for production drilling of 24 workpieces clamped on parallels arranged 360 degrees around the machine. Setup permits continuous drilling, saves approximately 30% in floor-to-floor time. Picture shows reaming a 1.250" hole at 140 rpm, .016 ipr. Hole is also back spot-faced to $2\frac{1}{2}$" dia.

world's largest builder of transfer machines

The Cross Co. saves up to 40% in setup and floor-to-floor time with Cincinnati Bickford Super Service Radials

When The Cross Company required precision, high-production drilling and tapping in the manufacture of their "Transfermatics," they chose a Cincinnati Bickford Super Service Radial. According to Burton Winke, shop supervisor, their first Super Service has now been in operation 15 years. It works 20 hours a day, six days a week — and has required only routine maintenance.

Today Cross uses eight Super Service Radials and one Super Service precision layout drilling machine with automatic spacing table. Other G&L machines at Cross include two Model 340-T and two Model 350-T Horizontal boring, drilling and milling machines.

Gets continuous production

One example of the savings achieved with these Radials is the drilling and tapping of 39 different radius holes in angular columns for Cross's multiple-spindle drilling slide units. Four of the angular columns are drilled and tapped on one side of the Radial, while another four are being set up on the other side. Production never stops, and the result is a saving of approximately 40% in setup and floor-to-floor time. Comparable efficiencies are obtained in the drilling, reaming and tapping of components for other Cross machines.

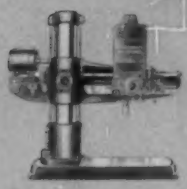
For complete specifications on the broad line of Super Service Radial Drills featuring choice of complete or partial hydraulic pre-selection, or lever control of all speeds and feeds, see your nearest Cincinnati Bickford representative, or write for new Bulletin.

In addition to the 6-ft. arm Radial, the Cross plant at Fraser, Mich., has an 8-ft. with a traveling base, another 6-ft. and five 4-ft. arm Super Service Radials for drilling and tapping a wide range of steel workpieces.

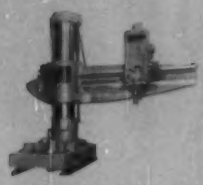
CINCINNATI BICKFORD DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
CINCINNATI, OHIO

Radial Drilling Machines, Upright Drilling and Tapping Machines, Layout Drilling Machines, Gang Drills and Precision-Drilling Machines designed for use with Spacing Table.

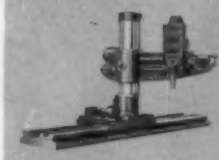
Choose from these top-performing Cincinnati Bickford drilling machines



NEW SUPER SERVICE RADIAL DRILLS with complete hydraulic pre-selection of all 36 speeds and 18 feeds. Sizes: 13" column, 4' arm to 19" column, 8' arm.



MASTER SUPER SERVICE RADIAL DRILLS — available with 40 hp motors, sizes up to 28" col. and 12' arms. All types of bases including track type.



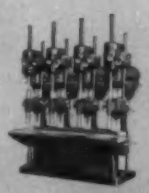
SLIDING-BASE SUPER SERVICE RADIAL DRILLS — —designed for high production, minimized set-up time. All controls centralized on heads. In complete size range with 3' to 12' arms.

HIGH-SPEED SUPER SERVICE RADIAL DRILLS — choice of 6 spindle speed ranges, from 3500 rpm down to 60 rpm with 3 hp motor. Available with 3' or 4' arms.

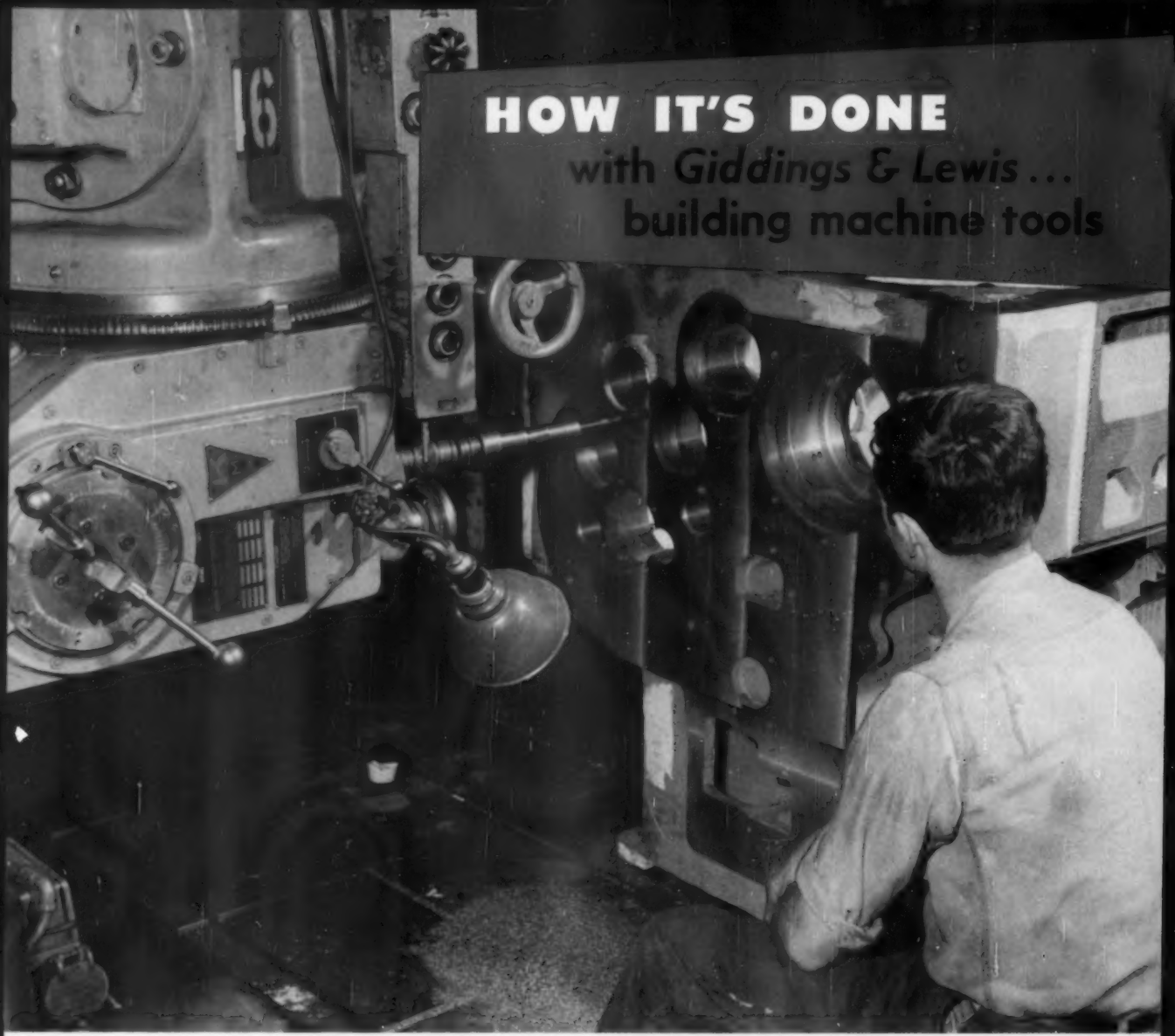
SUPER SERVICE PRECISION DRILLING MACHINE—specially suited to operations with automatic spacing table. For precision production work, jigs can be eliminated.

ALL-GEARED ROUND COLUMN UPRIGHT DRILLS in three sizes (21", 24" and 28") with 9 to 12 speeds.

ALL-GEARED BOX COLUMN UPRIGHT DRILLS—24" unit with 5 hp motor, 28" with 5 or 7½ hp.



SUPER SERVICE BOX COLUMN GANG DRILLS have entire mechanism in upper section. Each spindle is individually driven, saving time and space on successive operations.

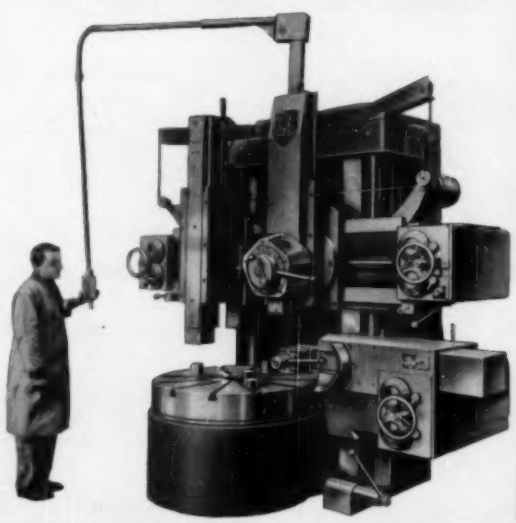


HOW IT'S DONE
with *Giddings & Lewis* ... building machine tools

Extend your production profit range
Kaukauna Horizontal drilling, tapping

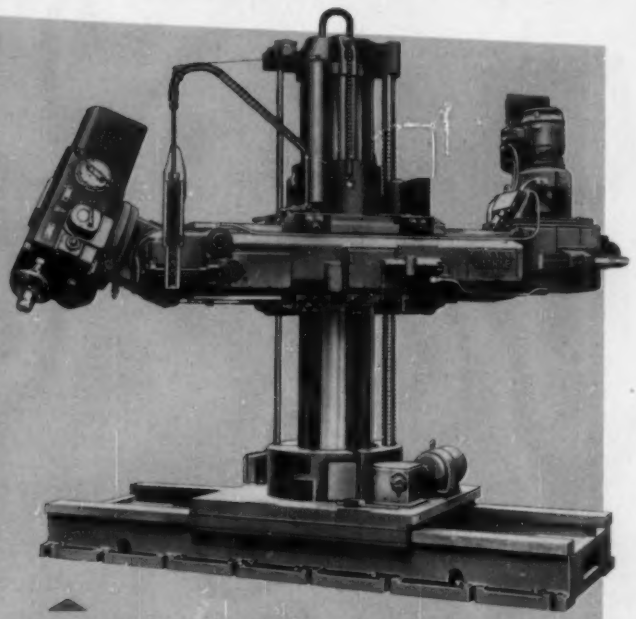
The Kaukauna line of Horizontal boring, drilling and milling machines features unusual power, rigidity and accuracy. Most effective use of modern, high-speed tooling. Two models with choice of 4" or 5" spindles, 42" continuous travel, 20 or 25-hp drive motors. Equipped with dynamic brake, centralized push-button control of all machine functions.

Kaukauna line of Vertical Turret Lathes features 50-hp drive, "joy stick" control of feed and traverse. Planetary transmission shifts feed *on-the-fly* and changes speed *in-the-cut*. Accessories include power chuck and turret indexing, tracer control, threading or drum scoring, taper turning, constant surface speed attachments, coolant system.



At Warner & Swasey, they perform radial, horizontal, angular and compound-angular drilling

all in one setup!



Kaukauna Universal Radial drilling machines are available in 6-ft. arm, 14" dia. column and 8'-10" arm, 9'-10" arm 22" dia. column, with spindle drive motors ranging from 2-20 hp. Complete pendant control of all powered machine functions including speed changing, column and runway movements . . . . final tool location by electrical push button control. Bails, leveling jacks and spreader arms built-in . . . permit conveniently moving machine to work, eliminating hand drilling or tapping.

KAUKAUNA MODEL 125-U UNIVERSAL RADIAL is used by Warney & Swasey, Cleveland, for drilling operations on lathe beds, and head castings of various sizes. Machinists consider this tilting head Kaukauna one of the safest and easiest-operating universal radial drills in the plant. They particularly like the fact that the Universal Radial can be securely locked in any position for drilling, tapping and spot facing operations.

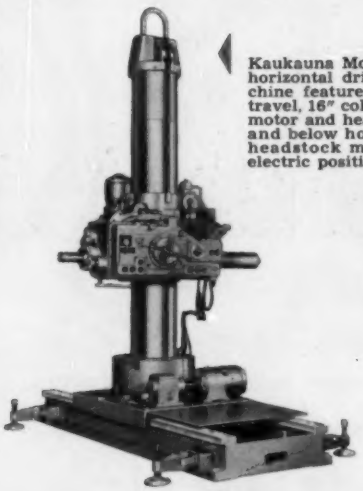
At left, the Universal Radial is shown on the job — drilling, boring, tapping, counterboring and reaming more than 60 holes of varying sizes in turret lathe bed and head casting. Workpiece is hi-nickel iron (ASTM-A48, Class 50), weighing approximately two tons.

Here's the production sequence:

1. One $^{47}/_{64}$" hole drilled at 465 rpm, reamed at 30 rpm, .012 ipr feed.
2. Sixteen $^{27}/_{64}$" holes drilled at 690 rpm, .007 ipr feed.
3. One $^{11}/_{32}$" hole drilled at 690 rpm, tapped at 340 rpm.
4. Ten $^{21}/_{32}$" holes drilled 465 rpm, .012 ipr feed . . . counter-bored and tapped at 160 rpm.
5. Seven $^{17}/_{32}$" holes drilled at 465 rpm, .007 ipr. feed . . . body counter-bored and tapped at 240 rpm, hand-feed.
6. One $^{55}/_{64}$" hole drilled 11" deep at 240 rpm, .007 ipr feed . . . reamed $^{9}/_{16}$" deep at 160 rpm, .012 ipr feed.
7. Two $^{7}/_{16}$" holes drilled 4" deep at 690 rpm., .007 ipr feed.
8. Twenty-two $^{5}/_{16}$" holes drilled 2" deep at 690 rpm, .007 ipr feed . . . body counter-bored and tapped at 240 rpm, hand feed.
9. One $^{7}/_{16}$" hole drilled 3" deep at 240 rpm, hand tapped.
10. Two $^{21}/_{32}$" holes drilled at 465 rpm, .012 ipr feed . . . back spot-faced 1" at 160 rpm, hand feed.

For facts about production profits, contact your Kaukauna sales representative.

with rugged and boring machines



Kaukauna Model 1030 Tilting Head horizontal drilling and tapping machine features 3" spindle with 24" travel, 16" column. Has 7½ hp drive motor and head that tilts 45° above and below horizontal. All controls headstock mounted . . . complete electric positioning provided.

For complete specifications and information on new line of Vertical Turret Lathes write for catalog VTL-3.

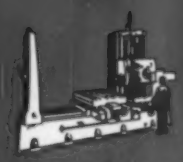
KMF G&L

KAUKAUNA MACHINE & FOUNDRY DIVISION

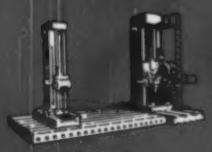
GIDDINGS & LEWIS MACHINE TOOL CO.

KAUKAUNA, WISCONSIN

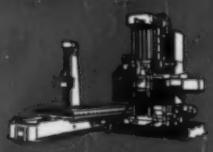
Vertical Turret Lathes, Universal Radial Drilling Machines, Horizontal Drilling, Tapping and Boring Machines, Gray Iron Castings.



G&L Table Type Horizontal Boring, Drilling and Milling Machines

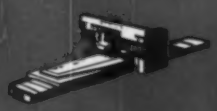


G&L Floor Type Horizontal Boring, Drilling and Milling Machines

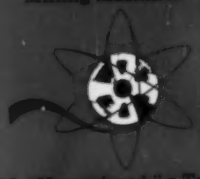


G&L Planer Type Horizontal Boring, Drilling and Milling Machines

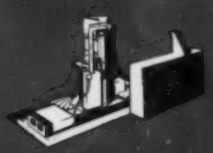
HYPRO Planer Type Milling Machines



G&L Skin Milling Machines



G&L "Numericord," a Tape Control System for Machine Tool Automation



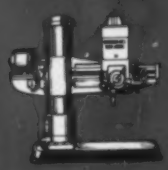
G&L "Variax" Multiple Axis Profile Milling Machines

HYPRO Openside Planers

HYPRO Double Housing Planers

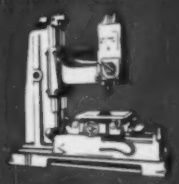
HYPRO Vertical Boring and Turning Mills

Plus a complete line of heavy-duty machine tool accessories and attachments



Cincinnati Bickford Super Service" Radial Drilling Machines

Cincinnati Bickford "Super Service" Upright Drilling Machines



Cincinnati Bickford "Super Service" Precision Production Drilling Machines

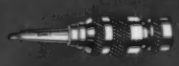
Cincinnati Bickford "Super Service" Gang Drills

G&L Vertical Turret Lathes

Kaukauna Universal Radial Drilling Machines

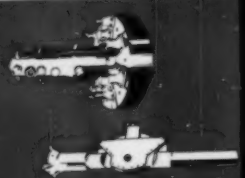
Kaukauna Horizontal Boring, Drilling and Tapping Machines

Davis Line Boring Bars and Block Type Tooling



Davis "Tap-Saver" Tapping Heads

Davis Planer Tools

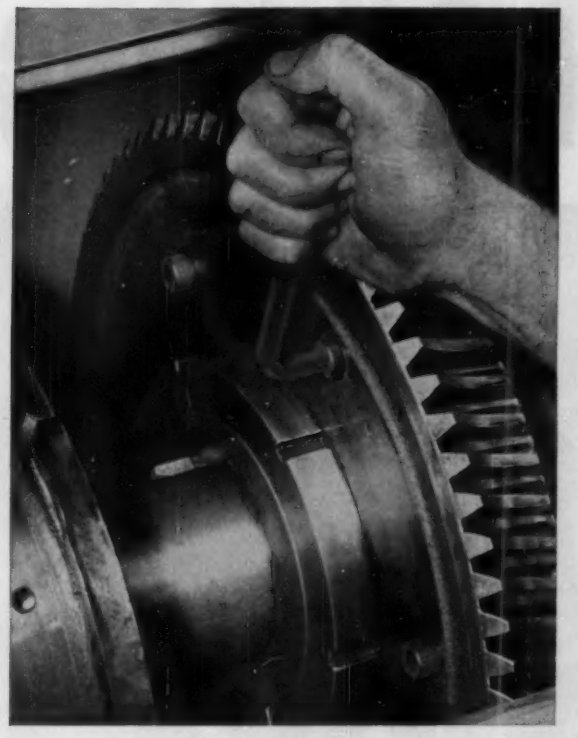


Davis Special Boring Tools

GIDDINGS & LEWIS MACHINE TOOL COMPANY

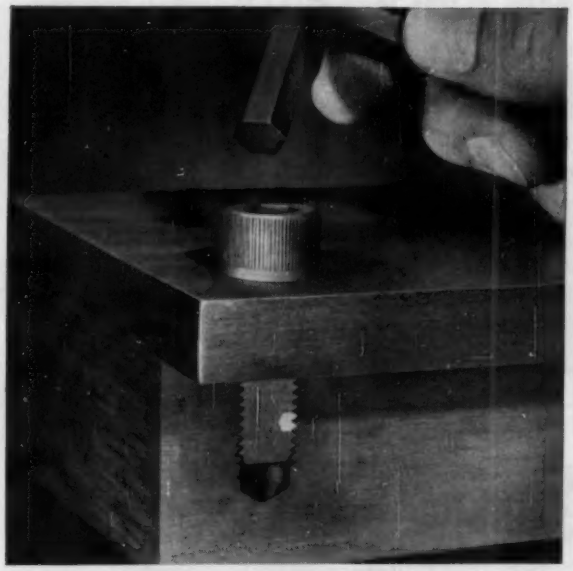
FOND DU LAC, WISCONSIN

Printed in U. S. A.



The ordinary fasteners securing the worm wheel to the drum shaft in this automatic screw machine loosened, causing $120 worth of damage to parts. Labor for the repair job cost $100. The ordinary fasteners were replaced with self-locking UNBRAKOS, and there has been no trouble since.

Vibration won't loosen self-locking UNBRAKO socket cap screws



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok* self-locking device eliminate fastener problems caused by vibration.

Take the drive system in the automatic screw machine illustrated above, for example. The screws originally used to secure the worm wheel to the drum shaft loosened, causing considerable damage, besides loss of production time. These have now been replaced with self-locking UNBRAKO socket head cap screws and the trouble has been eliminated.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or endless running of a machine won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives catalog and technical data on the complete line of UNBRAKO socket screws with the Nylok self-locking device. Or see your local industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

FOR MECHANICAL TUBING.

Because SHELBY SEAMLESS MECHANICAL TUBING comes to you with the hole and basic shape already made...

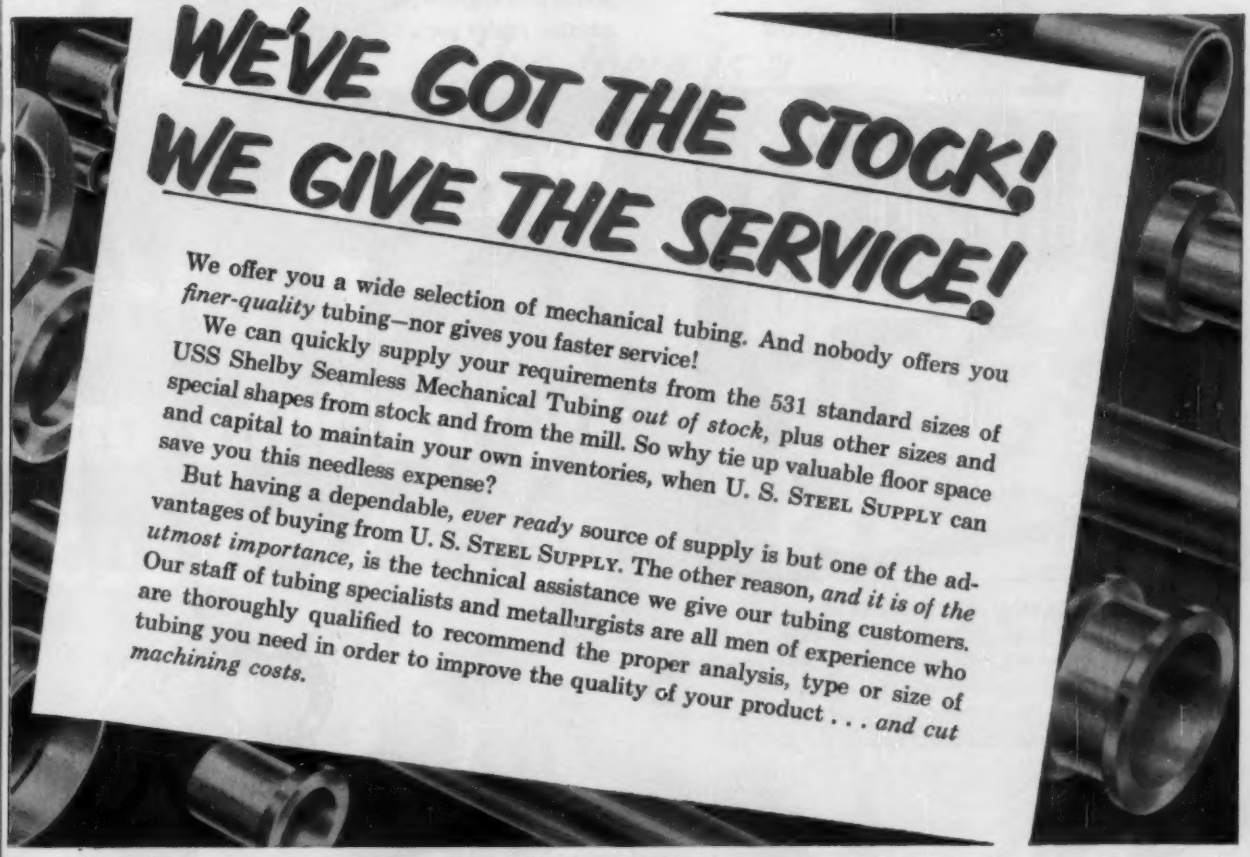
YOU CAN PRODUCE MACHINED PARTS LIKE THESE AT SAVINGS UP TO 50%

If you have been making parts like these from solid stock, you can make them better, faster and with less cost by switching to Shelby Seamless Mechanical Tubing. For with Shelby Mechanical Tubing, you eliminate or greatly reduce many time-and-labor-consuming operations connected with boring and machining.

Shelby Mechanical Tubing can also be effectively substituted for forgings, with equally attractive savings in time and labor, because the extremely close tolerances you get with tubing permit you to omit the double chucking required with forgings.

The excellent machining characteristics and uniformity of Shelby Seamless Mechanical Tubing enable you to *turn out parts by the millions, and the last part will be as metallurgically and dimensionally accurate as the first.* These advantages save wear on tools and needless waste of steel.

...CALL U.S. STEEL SUPPLY



WE'VE GOT THE STOCK! WE GIVE THE SERVICE!

We offer you a wide selection of mechanical tubing. And nobody offers you *finer-quality* tubing—nor gives you faster service!

We can quickly supply your requirements from the 531 standard sizes of USS Shelby Seamless Mechanical Tubing *out of stock*, plus other sizes and special shapes from stock and from the mill. So why tie up valuable floor space and capital to maintain your own inventories, when U. S. STEEL SUPPLY can save you this needless expense?

But having a dependable, *ever ready* source of supply is but one of the advantages of buying from U. S. STEEL SUPPLY. The other reason, *and it is of the utmost importance*, is the technical assistance we give our tubing customers. Our staff of tubing specialists and metallurgists are all men of experience who are thoroughly qualified to recommend the proper analysis, type or size of tubing you need in order to improve the quality of your product . . . *and cut machining costs.*

. . . and, remember, only U. S. STEEL SUPPLY gives you the extra time-saving BONUS of "GRADE MARKED" Shelby Tubing!

When you buy from U. S. STEEL SUPPLY, you are assured of getting not only the finest mechanical tubing on the market, but you also get our exclusive "Grade Mark" Service—*the newest aid to better stock room control offered industry*—at no extra cost.

"Grade Mark" Service is our new and improved method of bundling and marking shipments of Mechanical Tubing, and is designed to simplify the identification of the tubing in your order and make it much easier for your receiving department to stock incoming shipments properly. Your order will be shipped out in neatly strapped bundles, and each bundle will carry a seal which clearly shows the grade of tubing in that particular bundle. Thus without altering your stocking procedure in any way, you save time and trouble in locating, identifying, and handling the needed grade. Your order will be shipped from the warehouse nearest the point of delivery.

SEND FOR THIS FREE BOOKLET—It's a handy pocket size reference book on Shelby Seamless Mechanical Tubing that you'll turn to again and again. Covers tolerances, machining allowances, physical properties and other important data. For your free copy of this 115-page book, contact our nearest office.

U. S. STEEL SUPPLY

DIVISION

P. O. Box 1099, Chicago 90, Ill. USS *General Offices:* 208 So. La Salle Street, Chicago 4, Ill.

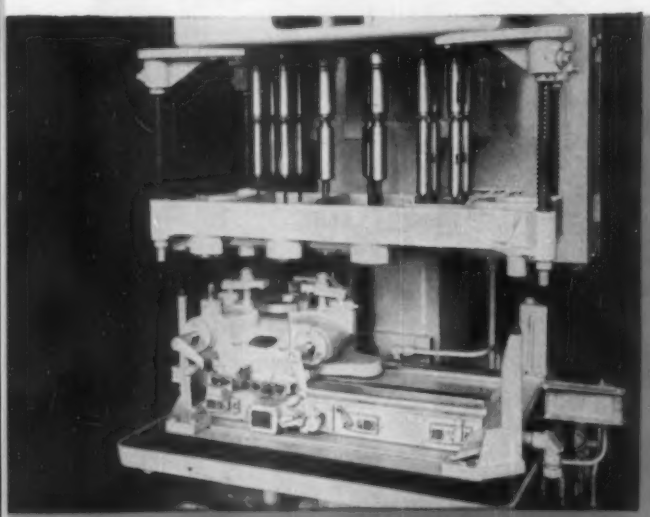
Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

Natco Naturals

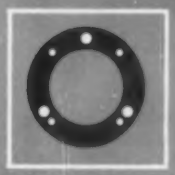
Cost-Cutting Ways
You Can Use
Standard Multi-Spindle Natcos

Any time your parts require machining *more than one hole*—drill, bore, face or tap—it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.

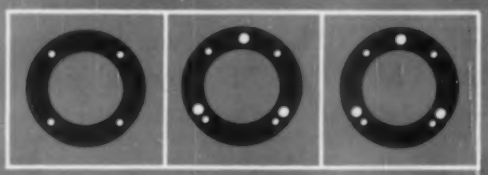


Multiple Drilling Operations on One Part-Face

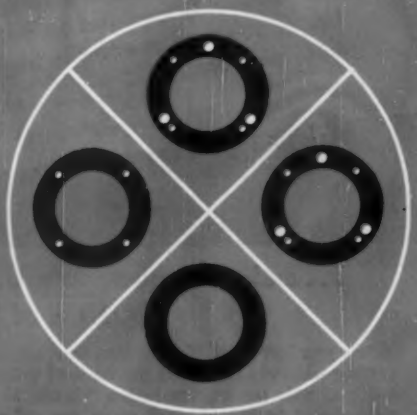
Straight-line indexing *on a Natco H6 produces 49 parts per hour. 4 holes drilled in first position, 3 holes drilled in second position, 4 holes c'bored in third position. One part completed every three strokes. Automatic cycling frees operator for other work. Illustrations below show three other ways of handling this part.*



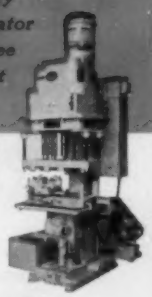
45 parts per hour. *Inexpensive box jig. Operator positions jig under appropriate spindles. One complete part for 3 strokes of machine.*



75 parts per hour. *3-position fixture. Operator shifts parts after each stroke. One part completed every stroke.*



155 parts per hour. *Rotary 4-position index table. Operator unloads and loads while three operations proceed. One part completed every stroke.*



Standard multi-spindle Natcos *range from 1 hp, 10-spindle machines to 25 hp machines with up to 72 spindles. Spindles in standard Natcos are driven through universal joints and located by either adjustable arms or bored slip plates.*

NATCO

National Automatic Tool Company, Inc.

Richmond, Indiana

Multi-spindle drilling, boring, facing & tapping machines. Special machines for automatic production.

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.

SIMONDS
FLAT GROUND
DIE STEEL

OIL HARDENING TYPE — Non-deforming, spheroidize-annealed for best machinability and consistently uniform hardenability — from Simonds' own steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. Individually packaged (18" and 36" lengths) with simplified heat treating instructions.

AIR-HARDENING TYPE — Non-deforming, spheroidize-annealed 5% chrome — more wear-resistant yet easy to machine and heat treat with uniformly excellent results — another product of Simonds' steel mill. Extra-smooth finish with all decarburization and surface defects removed. Wide hardening range. 36" lengths. Individually packaged with heat treating instructions.

SIMONDS FLAT GROUND DIE STEEL can be the practical solution to *your* production problem . . . especially where cost and quality are important factors. When you use Simonds packaged high quality alloy tool steel some of your manufacturing costs have already been eliminated. You get better results at lower costs because this steel is precision ground to accurate dimensions with an extra smooth finish all ready for scribing and cutting to size or shape. What's more, its wide hardening range makes heat-treating virtually foolproof . . . makes this analysis steel suitable for a multiplicity of uses. Specify "Simonds" and be sure of the greatest satisfaction and lowest cost in the long run. "1001 sizes for 1001 uses" in either OIL or AIR Hardening type steel. AVAILABLE FROM STOCK.

For Fast Service from Complete Stocks Call your **SIMONDS Industrial Supply DISTRIBUTOR**

125 YEARS OF GROWTH • 1832-1957

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que. • Simonds Divisions: Simonds Steel Mill, Lockport, N. Y. Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada • Heller Tool Co., Newcomerstown, Ohio

a new concept in gear accuracy!

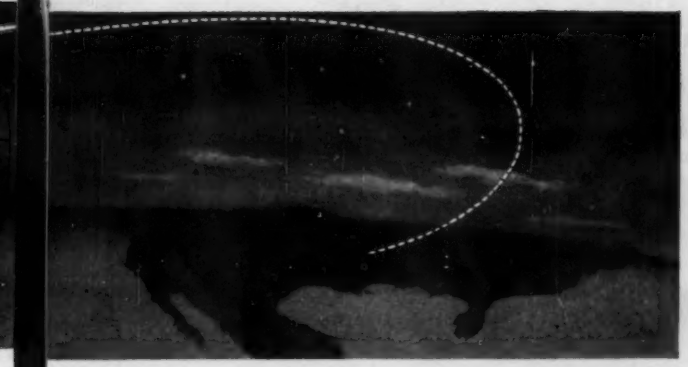
The control systems of modern missiles and aircraft are the "brains" which guide them to the target. Higher speeds, longer ranges and increased altitudes necessitate much more accurate control systems than in the past. One key to greater accuracy is gears made to previously unobtainable tolerances — gears which have an effective angular error of transmission of no more than ten seconds. And since speeds and ranges are increasing almost daily, the trend is toward closer and closer tolerances.

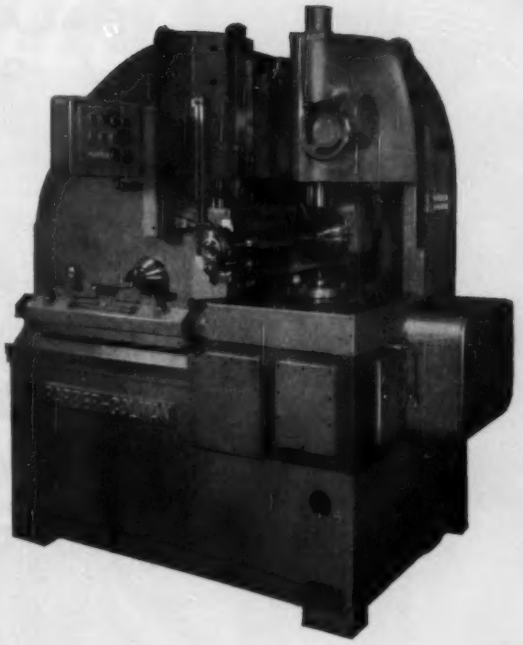
Barber-Colman engineers, working closely with Sperry Gyroscope engineers, have developed a machine and hobs which cut gears to closer tolerances than ever before produced. This machine is known as the "Ultracision" hobbing machine, and it cuts gears which will transmit uniform motion within ten seconds of arc or less, on a gear of 4″ diameter. This machine is now hobbing gears *on a production basis* in the Sperry plant.

What does an error of ten seconds mean? It means that a plane flying 5000 miles would be within 400 yards of target at destination if dependent on gear accuracy alone in the navigation system. Five years ago, a one-mile error was good enough, but it is not today. More accurate gears are a primary requirement for these precision controls.

We have been asked to compare ten seconds of angular error to a given amount of total composite error. Such a comparison is not practical because they involve two entirely different methods of inspection. Theoretically, one function of a gear is to transmit uniform angular rotation within the required limits of accuracy. Therefore, the measurement of angular error provides a direct method for determining the rotational accuracy of the gear. Total composite error is the amount of center distance variation obtained by rolling a gear with a master gear or rack. This method provides a relative measure of gear accuracy.

In trying to obtain the very finest gears, Sperry engineers have developed a method of inspecting angular errors with fantastic accuracy. They can now measure angular error between any corresponding points on gear teeth profiles to an accuracy of one-half second of arc. This method measures the effect of spacing, lead and profile errors. Presently allowable errors cannot exceed ten seconds of true angular displacement at any diameter along the involute.





One of the most important features of the "Ultracision" hobbing machine is the accuracy of the relative rotation between the work spindle and the hob spindle. This is probably the most important single feature affecting accuracy of gears produced. This relative rotation was inspected dynamically by means of a theodolite and a camera. All other machine elements were made to extremely small tolerances, resulting in hobbed gears within the required tolerance of ten seconds.

Original hobs for this machine were made to one-half the tolerances of Class AA hobs. However, tests showed that hobs made to Barber-Colman Class AA tolerances were accurate enough for this application, and they are now being used on this machine. Although Class AA tolerances are used, the hobs are really more accurate than these tolerances would indicate because the diameter is over twice the diameter of a standard hob of an equivalent pitch.

Since Barber-Colman engineers have designed and built the hobbing machine which cuts the world's most accurate gears, they have the experience to recommend the machine to produce gears to your accuracy requirements. In most cases, standard-type machines will satisfy your requirements. On our most accurate standard-type machine, we guarantee that it will hob a 4″ PD, spur gear within .0002″ adjacent and .0004″ non-adjacent spacing error.

We invite you to submit your gear specifications and problems for analysis and recommendation by our engineers.

For more information about the "Ultracision" hobbing machine, write for descriptive literature.

BARBER-COLMAN COMPANY

616 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

Chips flow freely, since chip driver contours are always of exact size, shape, and position.

BALANCED ACTION TAPS
cut clean—always!

When you know that a tap has been manufactured with great care and skill—you're assured of closely controlled hole size and long tool life. Only Winter makes taps with Balanced Action. They give clean-cutting performance—*always.*

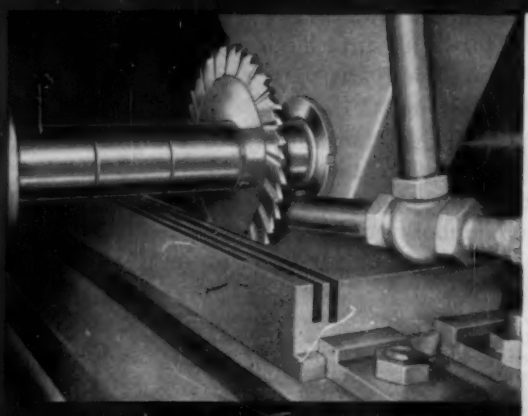
CALL YOUR WINTER DISTRIBUTOR

WINTER BROTHERS COMPANY
Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit
Cleveland • Chicago • Dallas • San Francisco • Los Angeles
Division of National Twist Drill & Tool Co.

National

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH., U.S.A.



The search that never ends

Finding the best way to do a deep-slotting job in the National research laboratory.

National will have the right one

National's complete line of tools can save you time and tool-life. For instance—just tell National about your sawing or slotting job. You'll get a tool that is sized, styled, and designed to do the best job.

NATIONAL TWIST DRILL AND TOOL CO.

Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit Cleveland • Chicago • Dallas • San Francisco • Los Angeles

CALL YOUR NATIONAL DISTRIBUTOR

TWIST DRILLS • REAMERS • COUNTERBORES • MILLING CUTTERS • END MILLS • HOBS • CARBIDE AND SPECIAL TOOLS

Bay State mounted wheels are used by Lycoming craftsman, Fred McCall, on hardened steel drive component to "break" sharp edges which might cause points of weakness.

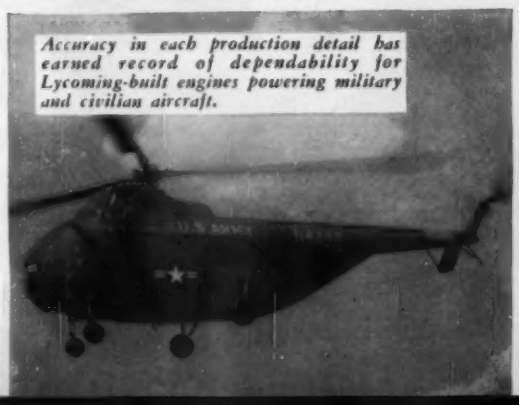
Grinding at Lycoming Needs Wide Range of Wheels — Versatile Engineering

TO the Lycoming Division of Avco Manufacturing Corporation at Stratford, Connecticut, *dependability* in aircraft engines is as important a product as the engines themselves! And precision grinding, in many forms, helps produce this built-in dependability.

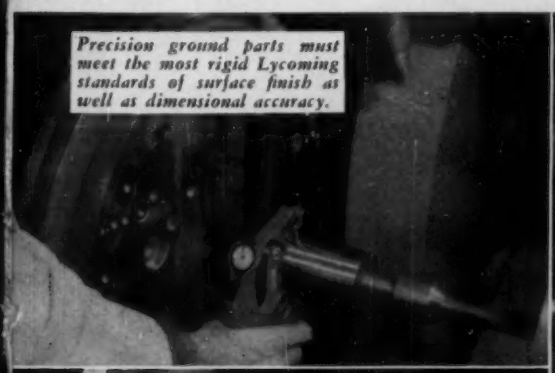
For example skilled deburring of the accessory drive gear component shown on this page is important because sharp edges could set up points of weakness . . . and human life will be at stake.

On these carburized steel parts with surface hardness to 65 Rockwell C, a small spherical wheel of exceptional durability is needed to do the job neatly and precisely. A wheel too soft grooves quickly and leaves a ragged edge, needing another operation to finish it. Bay State specified, and manufactures for this job, a wheel that skillfully combines the necessary hardness with a clean cutting action which leaves no surface burn — also important because all parts must pass 100% acid-etch inspection.

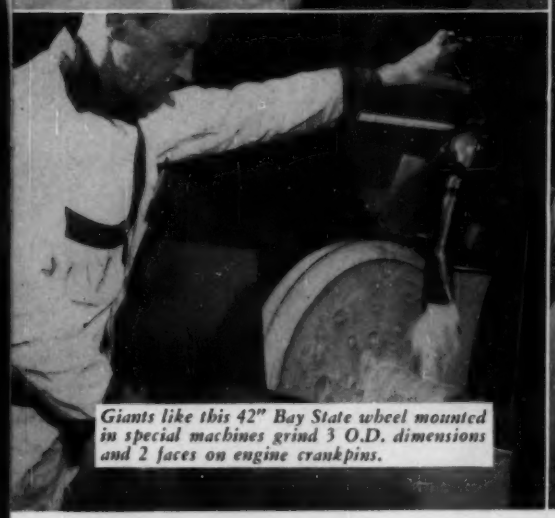
Specifying and faithfully reproducing these efficient small wheels is one important Bay State contribution to the dependability of Lycoming-built engines.



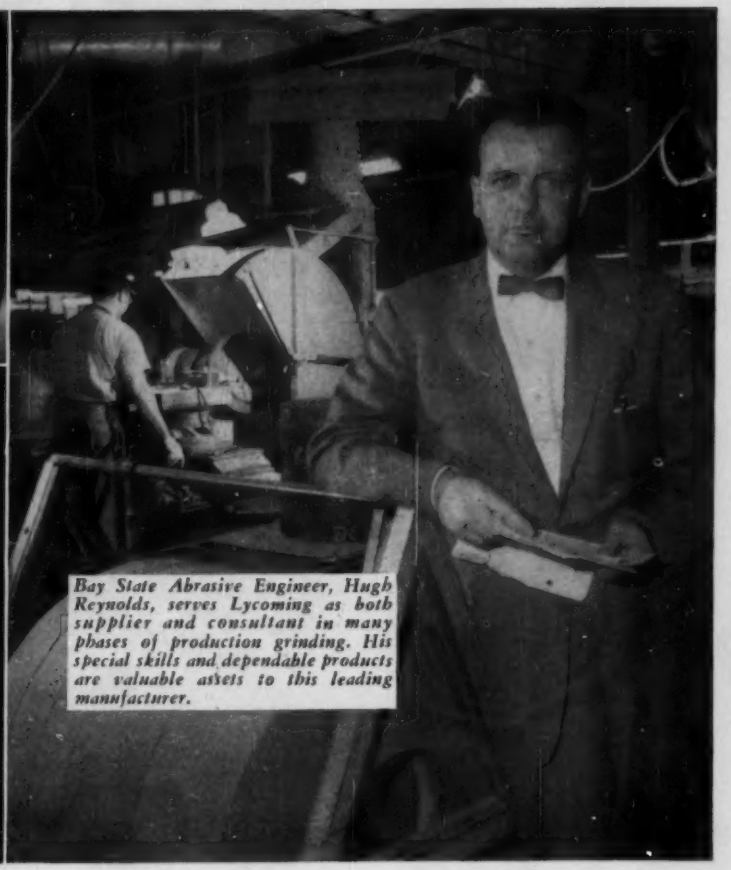
Accuracy in each production detail has earned record of dependability for Lycoming-built engines powering military and civilian aircraft.



Precision ground parts must meet the most rigid Lycoming standards of surface finish as well as dimensional accuracy.



Giants like this 42" Bay State wheel mounted in special machines grind 3 O.D. dimensions and 2 faces on engine crankpins.



Bay State Abrasive Engineer, Hugh Reynolds, serves Lycoming as both supplier and consultant in many phases of production grinding. His special skills and dependable products are valuable assets to this leading manufacturer.

In the larger grinding wheel sizes, too, Lycoming depends on Bay State for many critical operations. The multi-purpose cylindrical grinding set-up illustrated above is a typical case.

This special Landis grinder mounts a mammoth wheel, 42" x 6" x 12", specified by Bay State to perform a series of precision grinding operations on engine crank-pins. Three different O.D.'s and two faces are ground on this critical component, removing from .015 to .050 stock. The part made of AMS-6415 nitriding steel is finish ground in the soft state at about 35 Rockwell C. The successful Bay State specification was selected for its ability to produce fine, uniform finish, yet hold its corners for long productive periods between dressings.

At Lycoming and other plants, Bay State engineers are solving grinding problems . . . applying grinding wheels from the smallest to the largest . . . specifying grinding wheels for every purpose, every type of machine.

With confidence, call in Bay State through any of its branch offices or distributors.

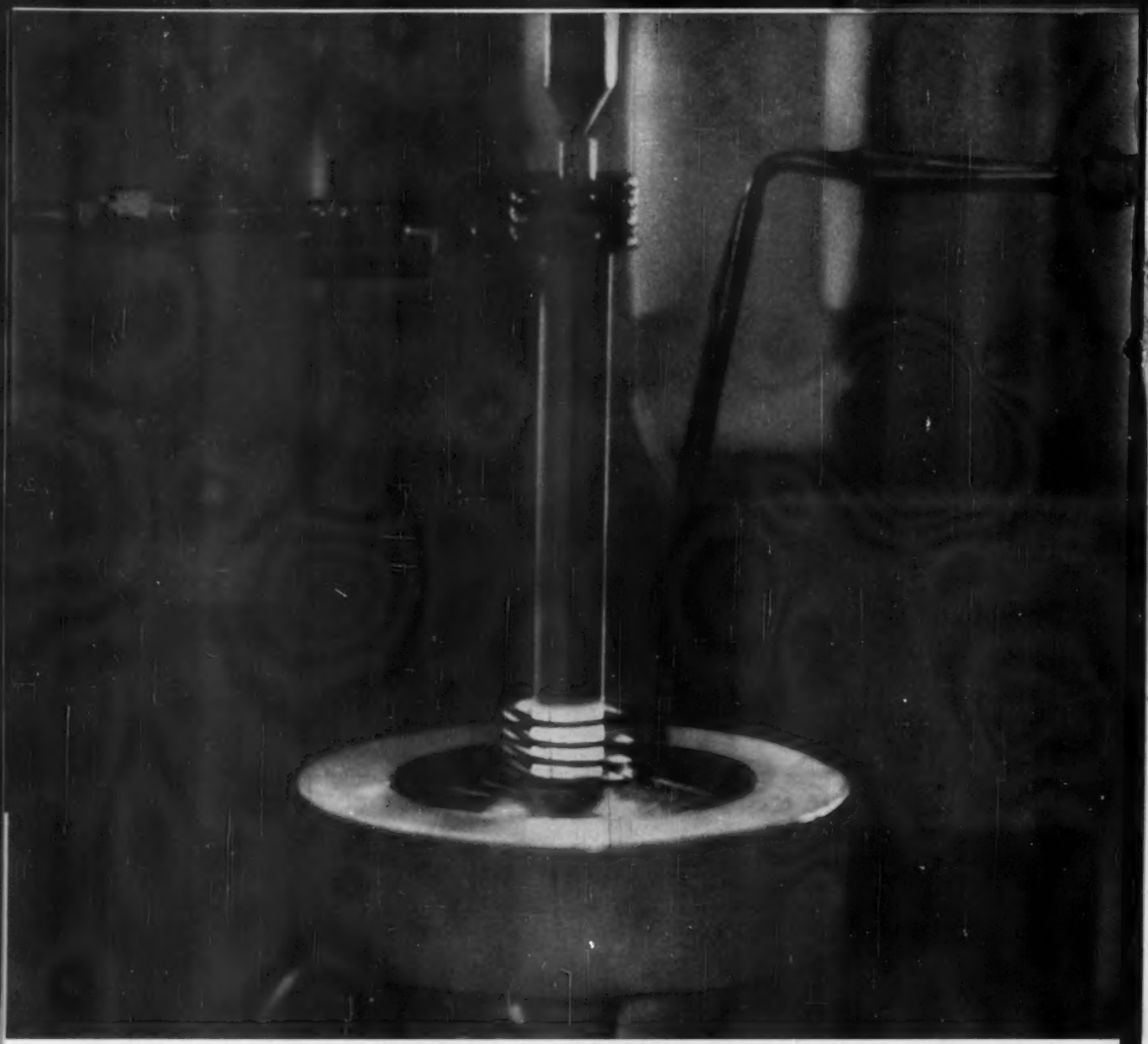
BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Mass., U. S. A.

Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.

Distributors — All principal cities • In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE ® WHEELS of PROGRESS



Ketos shaft being induction hardened to Rockwell 55-56, while ends remain soft for final machining. Photographed at Control Instrument Co., Inc., Brooklyn, N. Y.

KETOS has wide hardening range with minimum volume change...

Ketos is a low priced alloy tool steel that can be hardened from low temperatures with practically no volume change. It has deep hardening qualities, and a fine grained structure, that make it desirable for many production parts.

That's why nondeforming Ketos is well suited not only for most tool steel applications such as gauges, dies, and taps but also for close-tolerance, wear-resistant parts like the actuator bar shown in the induction heating unit above. The thin contact edges of this particular part withstood a "life test" of over 4-million high speed blows. No other steel tested lasted more than 1-million cycles before it chipped and failed.

If Ketos sounds like the steel you should be using, call your nearby Crucible warehouse. Stocks of Ketos and dozens of other special tool steels are large, delivery fast. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

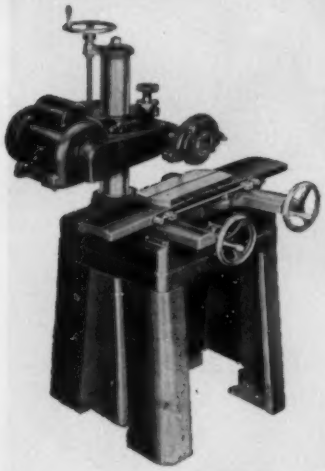
Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

NEW— from WT ALKER-TURNER

A complete line of "Light-Heavyweight"

GRINDERS



The finest precision grinders ever built—the new Walker-Turner "Light-Heavyweights." Designed to do the most exacting grinding operations *quickly* and *economically*, and save you time and money. Low initial cost, positive accuracy, and advanced safety features make the Walker-Turner "Light-Heavyweight" Grinders ideal for your plant.

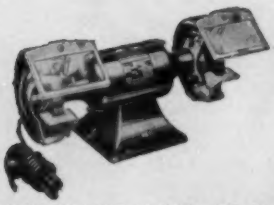
Ask your Walker-Turner distributor to demonstrate the superior advantages of these versatile grinders and other famous Walker-Turner tools. He's listed in your telephone book's yellow pages under "Tools." Or mail the coupon below for complete information.

NEW WALKER-TURNER SURFACE GRINDER . . . Use it as a big capacity grinder that offers you the extra ability to do chip-breaker and tool and cutter grinding. You get simple set-up, precision accuracy, AND surprisingly low cost.

NEW WALKER-TURNER 6" CARBIDE TOOL GRINDER . . . keeps your carbide-tipped cutting tools at peak efficiency. Vibration-free operation assures true grinding. Tables tilt to permit wet or dry grinding at any angle.

NEW WALKER-TURNER DUST COLLECTOR . . . has strong, pressed steel cabinet, removable filter, enclosed ½ H.P. motor and fan that moves 350 cubic feet of air per minute. Unit is compact and portable.

NEW WALKER-TURNER 7" TOOL GRINDER . . . combines positive accuracy with advanced safety features. You get dual shatterproof-glass eye shields, engineered wheel guards, dust chutes, removable steel side plates, and adjustable spark deflectors.



NEW WALKER-TURNER 6" BENCH GRINDER . . . takes up minimum space for grinding, polishing and buffing. Balanced grinding wheels and precision ground shaft provide smooth, accurate performance.

walker-Turner

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WF-21, 400 North Lexington Ave., Pittsburgh 8, Pa.

☐ Please send name of my Walker-Turner distributor.
☐ Please send literature on Walker-Turner Grinders.

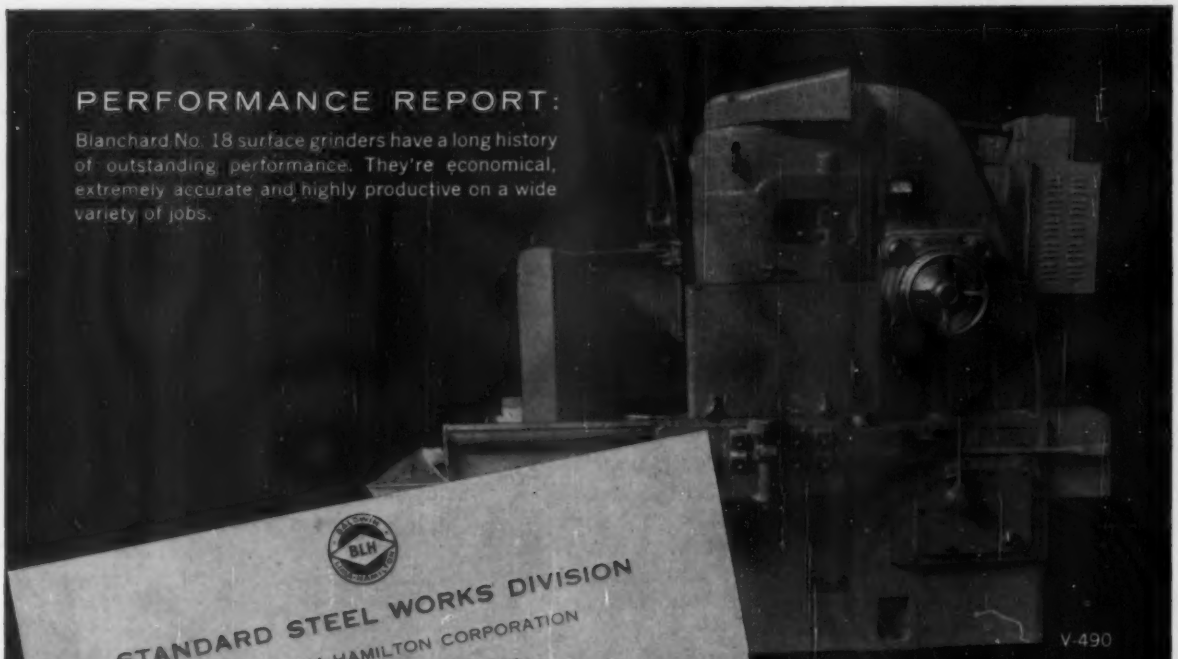
Name_____

Address_____

City_____ Zone_____ State_____

PERFORMANCE REPORT:

Blanchard No. 18 surface grinders have a long history of outstanding performance. They're economical, extremely accurate and highly productive on a wide variety of jobs.



V-490

STANDARD STEEL WORKS DIVISION
BALDWIN-LIMA-HAMILTON CORPORATION
BURNHAM, MIFFLIN COUNTY, PA.

November 26, 1956

Machinery Associates, Inc.
325 E. Lancaster Avenue
Wynnewood, Pa.

Attention: Mr. C. Dawson Day, Vice President

OUR PURCHASE ORDER 8781-4576
YOUR ORDER M2-1-809

Gentlemen:

In response to your letter of October 12, 1956 relative to the No. 18 Blanchard High Power Vertical Surface Grinder which you furnished to us on the above order, I wish to advise that this machine has been entirely satisfactory. The machine was purchased primarily for grinding form and hollow bore cutters for our machine shops and the machine was installed in our Small Tool Department. We estimate that the savings which we have already experienced will allow us to amortize the machine in a period of approximately one year. Since the work load on cutters alone kept the machine busy only approximately one-third of the time, we have been able to do additional grinding which was formerly done on other machines and have been able to realize the same economies as we did on the grinding of the cutters.

Yours very truly,

W. E. Shisler, Jr.
Chief Engineer

PUT IT ON THE BLANCHARD

Send today for your free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding", third edition.

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

Lightning fast speed change

a money making virtue!

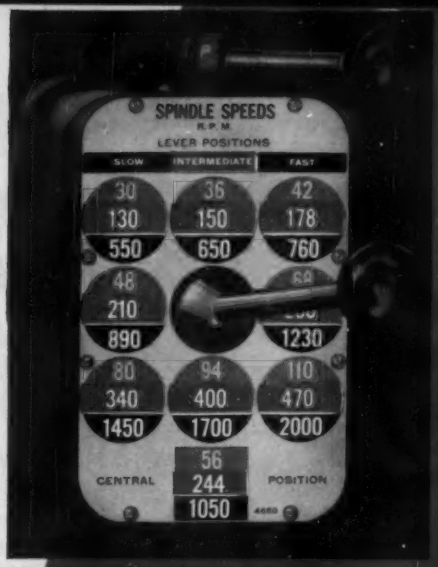
This time saving feature of "AMERICAN" Pacemaker Lathes appeals strongly to operators who acclaim it a real money maker for them.

The speed plate is direct reading and shows at a glance the available spindle speeds and how to secure them. Operators can't go wrong. So fast, so easy to read and so simple that they do not hesitate to make speed changes to secure correct cutting speeds.

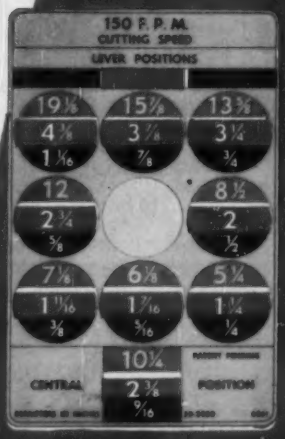
In addition, cutting speed snap-on plates are available indicating the lever positions for cutting various work diameters at the selected feet per minute cutting speed. These plates may be quickly applied and changed for the desired cutting speed.

No system for securing cutting speeds could be simpler, faster or less expensive in first cost and maintenance.

- *These and other fine features of the "AMERICAN" DeLuxe Model Pacemaker are illustrated and described by Bulletin No. 116.*



Spindle Speed Plate (Direct Reading)



Cutting Speed Plate (Direct Reading)

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

5 Basic Reasons why MARVEL HACK SAWS CUT-OFF MORE ACCURATELY...

The consistently accurate performance of MARVEL Heavy Duty Hack Saws is no accident. MARVEL engineers knew, many years ago, that to produce and maintain accurate cutting-off, a hack saw must be designed and built like a fine machine tool.

Some of the basic design principles built into the modern MARVEL Hack Sawing System that makes it the most accurate cutting-off method you can use are:

1. V-Way Design...Greater Rigidity

Upright and Saddle are precision machined and fitted to form a rigid, integral unit capable of withstanding any cutting load with no deflection or side movement.

2. Anti-Friction Bearing Construction

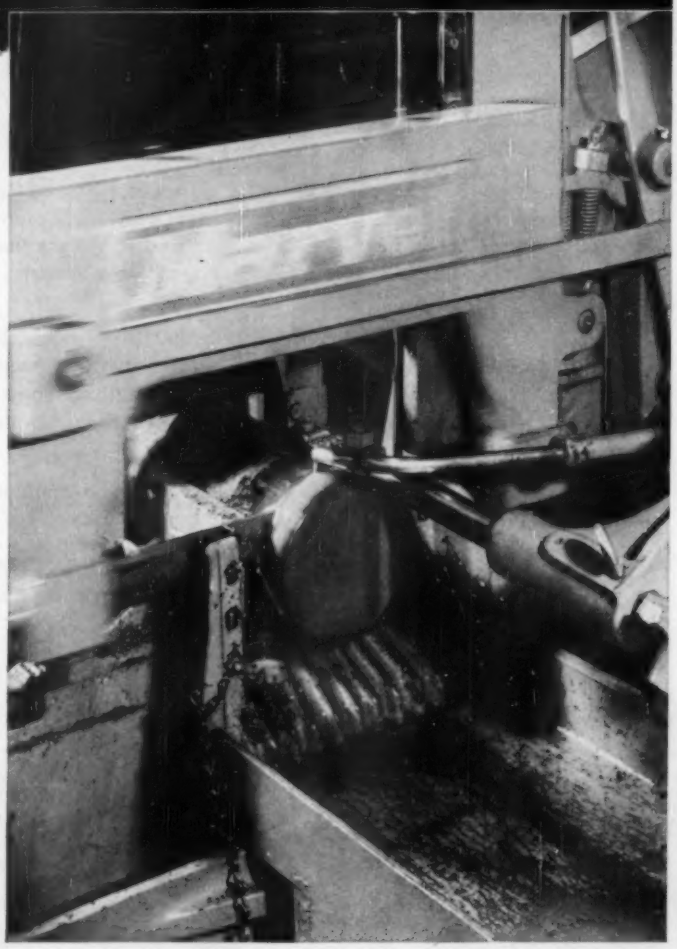
Anti-friction ball or roller bearings are used at all load carrying points. Even the strongly braced saw frame reciprocates on heavy duty, fully enclosed preloaded ball bearings which provide permanent, frictionless rigidity and true-running, straight line cutting strokes.

3. Minimum Blade Frame Reach

Close-coupled design and crank lever action of MARVEL Saws keeps the saw frame and blade reach very short in relation to the vertical V-ways on which the unit is mounted. This insures optimum rigidity, even under the most severe operating conditions.

4. Positive Relief Blade Lift

On the return stroke, positive relief lift raises the blade to provide proper and "cushioned" lead-in on the next cutting stroke. This prolongs blade sharpness, life and accuracy.



5. Rigid Cutting Tool

Cutting-off accuracy requires a rigidly held, relatively short cutting tool. MARVEL Unbreakable High-Speed-Edge Hack Saw Blades, which combine a narrow high speed steel cutting edge permanently welded to a tough alloy steel body, can be tensioned from 200% to 300% more taut than ordinary blades. This provides a most rigid cutting edge.

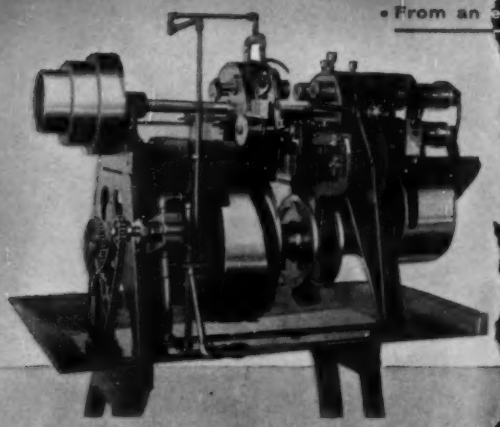
Write for the MARVEL Catalog and the complete story on MARVEL METAL CUTTING SAWS

MARVEL *Metal Cutting* SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

Thanks, Mr. Keebler...

You have said it better than we could!



First successful multiple-spindle automatic—the granddaddy of *all* of today's "multiples"—developed and built by National Acme in 1893.

• From an editorial in April, 1957 **AUTOMATION**

by JAMES C. KEEBLER, Associate Editor

Those who think of automation only in terms of production techniques developed since Harder first uttered the magic word *Automation* are thumbing right past a few useful rules. If we aren't careful these newly trained manufacturing engineers will be overlooking a few tricks that have been in the trade since Hector was . . .

Overpublicizing the new developments might overshadow the fact that the methods developed long ago fit the pattern of present-day automation techniques and therefore should not be overlooked in evaluating possible production processes.

A case in point is the automatic screw machine used on these bearing rings. This machine development was placed on the market in the 1890's and incorporated such sound basic automatic machine thinking that it remains primarily the same in principle in its 1957 model.

On these machines are performed in succession and without manual attention virtually all of the circular machining operations required on ball bearing rings. This is automation. Just because the technique is not new is no reason why it should not be given its just place in the galaxy of automation studies.

• History has recorded the machine tool development about which Mr. Keebler writes as the direct prototype of present day Acme-Gridley Multiple Spindles—in fact, it's the granddaddy of *all* of today's "multiples".

• Since the inception and development in 1893 of the first successful Four Spindle Automatic Screw Machine, National Acme has extended the inherent circumferential automation principle of its basic design to six and eight spindle machines. These machines have set the pace with which to meet, head-on, industry's need for greater and less costly production.

• Knowing that the future will make ever greater demands on circumferential automation, National Acme will continue to expand applications for Multiple Spindle Automatics. Who knows?, some day the line may include not only 4, 6 and 8 spindles, but 12 and 16 spindle machines as well.

National Acme

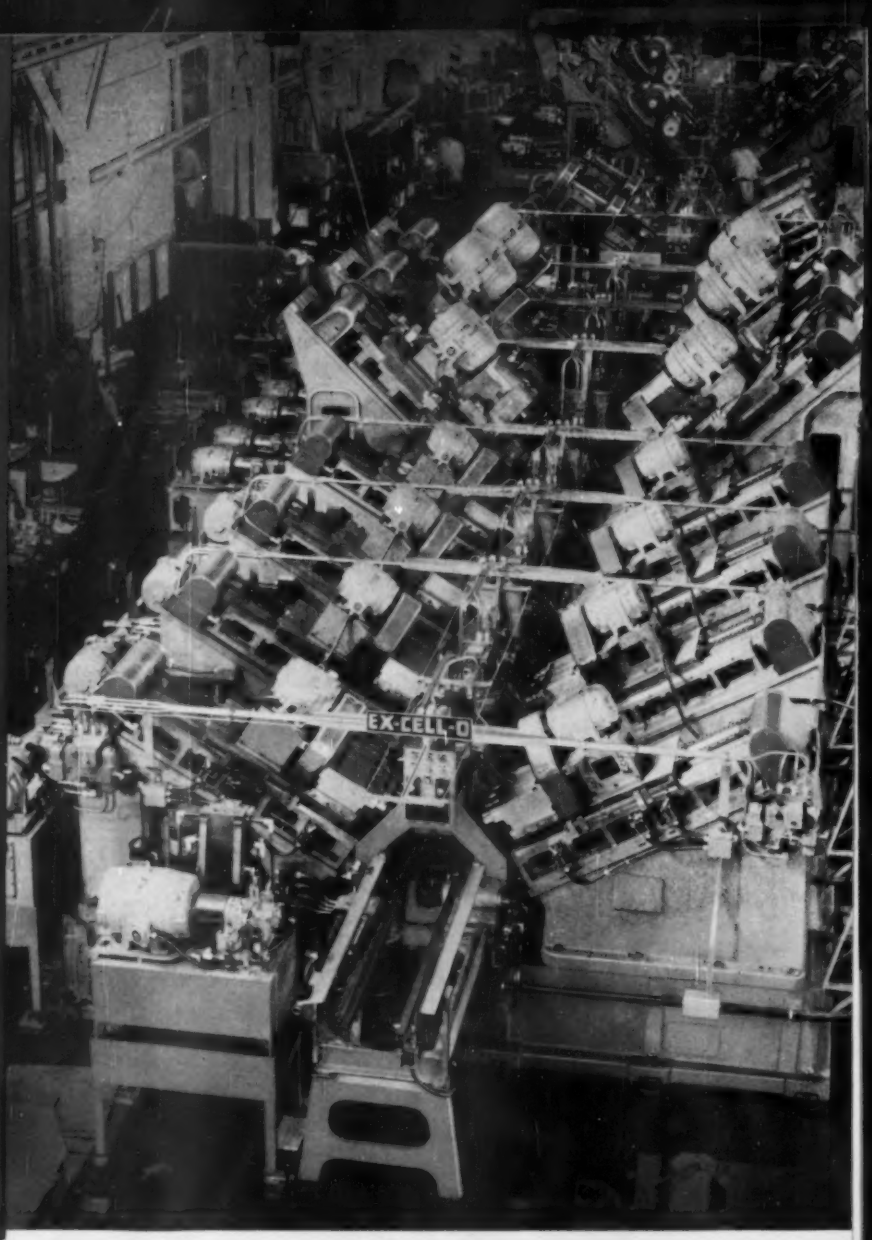
THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

XLO

EX-CELL-O FOR PRECISION

3000 Engine Blocks Per Day–

How one company competes in the world's toughest market . . .



The photograph above is a view in the auto plant shortly after the automation line was installed. At right above, a portion of the line as it neared completion in the Ex-Cell-O plant.

These Ex-Cell-O automation machines play an important part in turning out engine blocks for one of the "big three" of the automotive industry. This manufacturer's engine must compete in one of the toughest markets in the world.

Ex-Cell-O's part in the manufacturing process is 1200 feet of production line using the newest machines in assembled integrated units. Among the precision machining operations performed are boring, broaching, chamfering, milling, reaming and grooving.

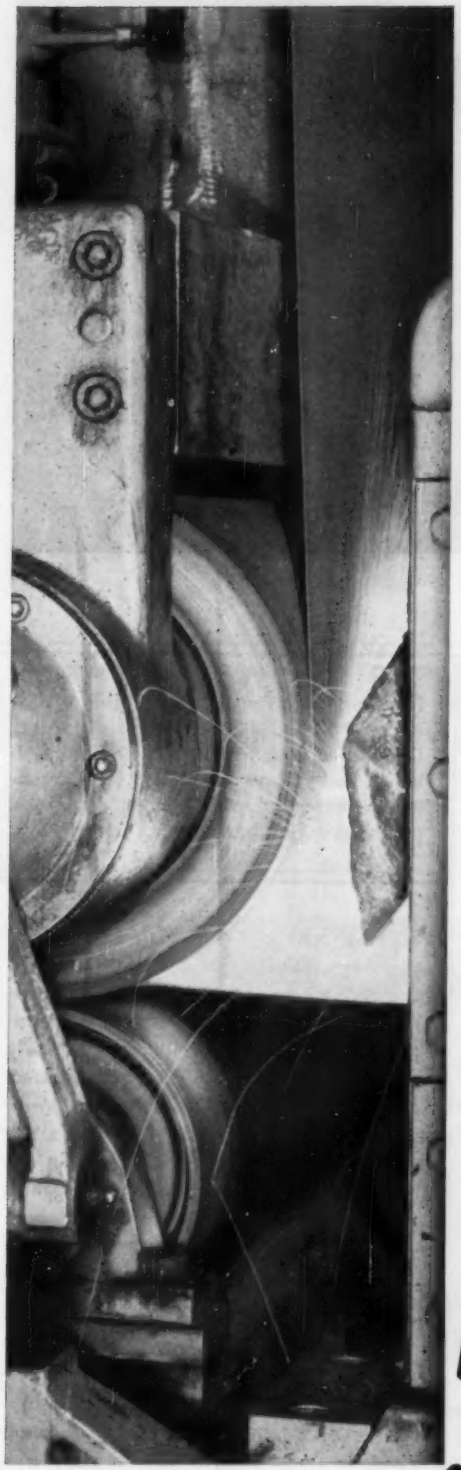
Ex-Cell-O—builders of standard and special machine tools for 25 years—uses standard bases and subassemblies wherever possible. This means that product changes do not necessarily obsolete equipment. You save, too, in initial cost.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-43



Flat Polish Faster Smoother... and Use Fewer Belts!

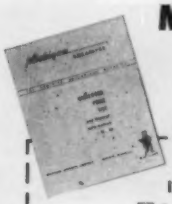
Sharper Cutting, Cleaner Cutting Michigan Belts will do it for YOU!

If you're flat polishing you're after *surface*. And with Michigan Abrasive **RED COAT** brand belts you get the surface you want faster and with the same characteristics run after run.

Illustration shows the **RED COAT** belt spark pattern is concentrated close to the sheet . . . hot waste particles are thrown off—not carried by the belt. The fact that **RED COAT** belts resist loading is just one reason they cut sharper, longer . . . give you better results. You can *see* how sharper cutting Michigan belts mean savings in time and money. Just check the *perfect finishes* produced on sheets that had especially bad surfaces before a *single pass* through your machines. You have fewer rejects—spend less time in handling and second runs.

Like all Michigan belts, sheets and discs, **RED COAT** flat polishing belts produce the results users want. They produce them faster, longer and at less cost. The right coated abrasive you need for any job is listed in our big free catalog! Send for it today and call your Michigan representative the next time you order any coated abrasives. You'll enjoy using the best . . . Michigan

MICHIGAN ABRASIVE CO.
Manufacturers of "The Humidity-Controlled Abrasive"
11910 E. 8-MILE ROAD • DETROIT 5, MICHIGAN



Mail this Coupon!

I want more information on Michigan Abrasives!
☐ Send your Catalog ☐ Have representative call.

Name_____

Title_____

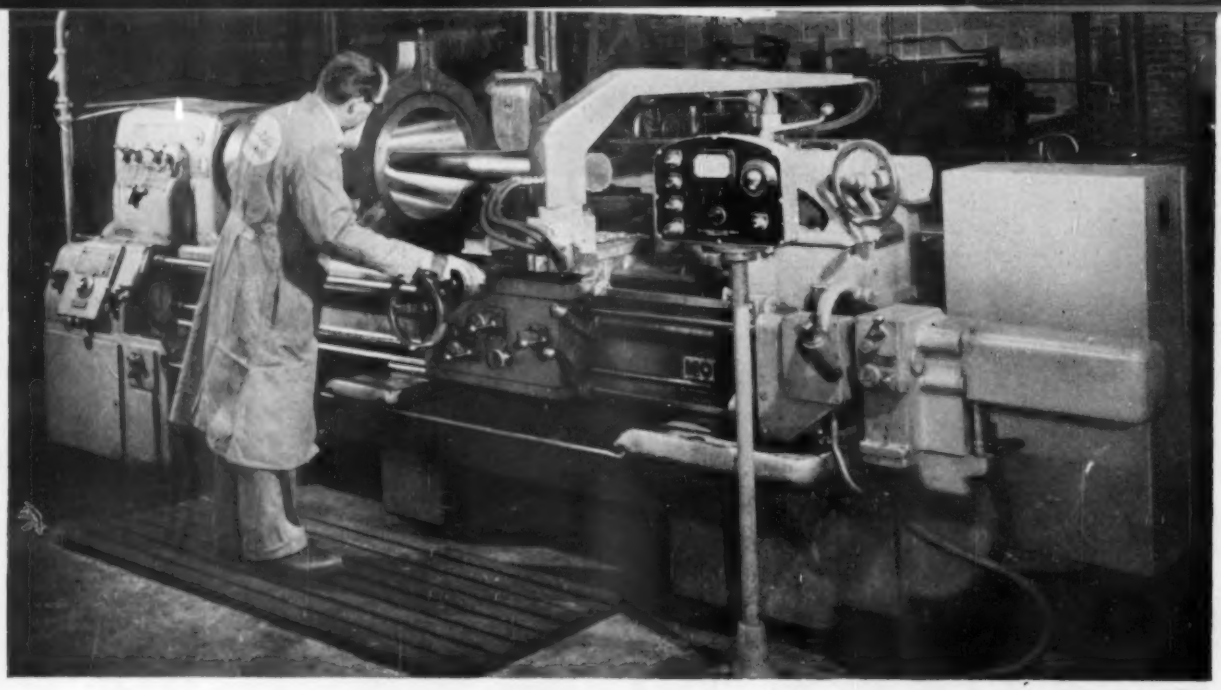
Firm_____

Address_____

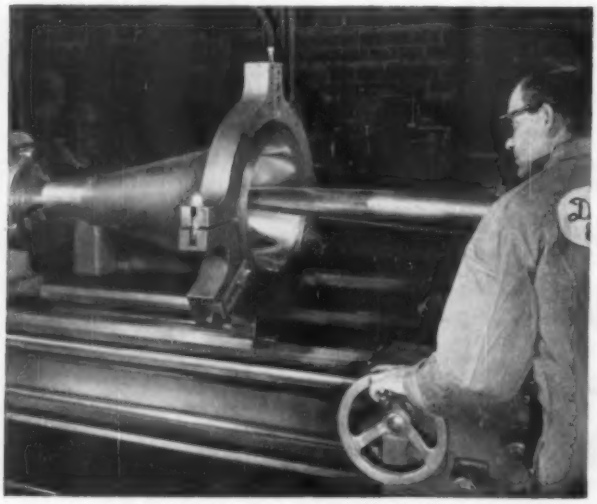
City_____ Zone_____ State_____

RED COAT BRAND

Michigan ® ABRASIVES



A Monarch 20" Series 61 Swiveling "Air-Gage Tracer" Lathe contour boring a jet cone to a depth of 31½". The I. D. starts at approximately 18½" and decreases to approximately 4". The contour of the I. D. has a radius and blend tapers. Material is the tough super-alloy called A-286, one of the toughest of all the new super-alloys to machine. "Some jobs", says Diversey's president, "can only be done on Monarch swiveling-type tracer lathes".

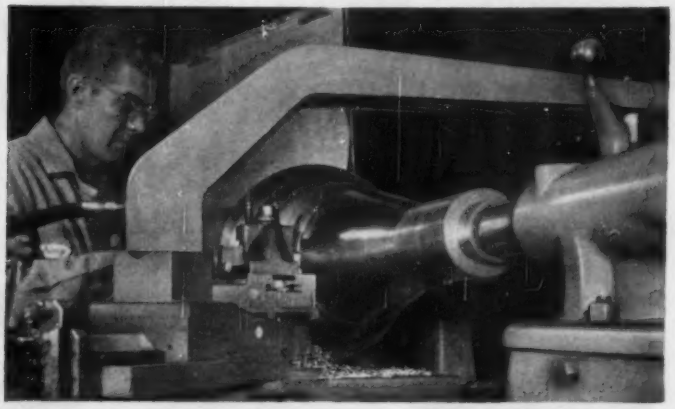


Hitch up the talents of DIVERSEY ENGINEERING COMPANY, Franklin Park, Illinois and their tracer-controlled Monarch lathes, and you get one of the most important production teams in our jet engine and guided missile programs.

Starting with one Monarch lathe seven years ago, Diversey is now the largest in the country specializing in these components. Fifteen lathes—an exclusively Monarch installation—are now in practically around-the-clock use. All but two are tracer-controlled. Latest is a 48" swing swiveling Air-Gage Tracer type machine, the capacity of which places Diversey in the position of being one of the few companies in the United States with the equipment and know-how to handle machining on some of the large, new guided missile contoured parts.

Monarch's tracer controlled lathes are more than the Secret Weapon's secret weapon—they're everybody's weapon for better production. Yours too! Ask for Booklet #2608 —or a sales engineer . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

The same Series 61 turns the same jet cone, described on opposite page. This operation uses practically the full swing capacity of the lathe.



"GUIDED" LATHES for Guided Missiles

Contour Turning of "Super-alloys" Made Easy

A Monarch 20" Model M "Air-Gage Tracer" Lathe finish machines the center bulkhead of a guided missile to 63RMS. Material is heat-treated hi-nickel alloy. In the foreground of above illustration is a number of completed bulkheads while toward the tail end of the machine are some nose cones for a missile head. These are also turned on the 20" Model M. Smaller view (above right) shows clearly the unusual finish imparted.

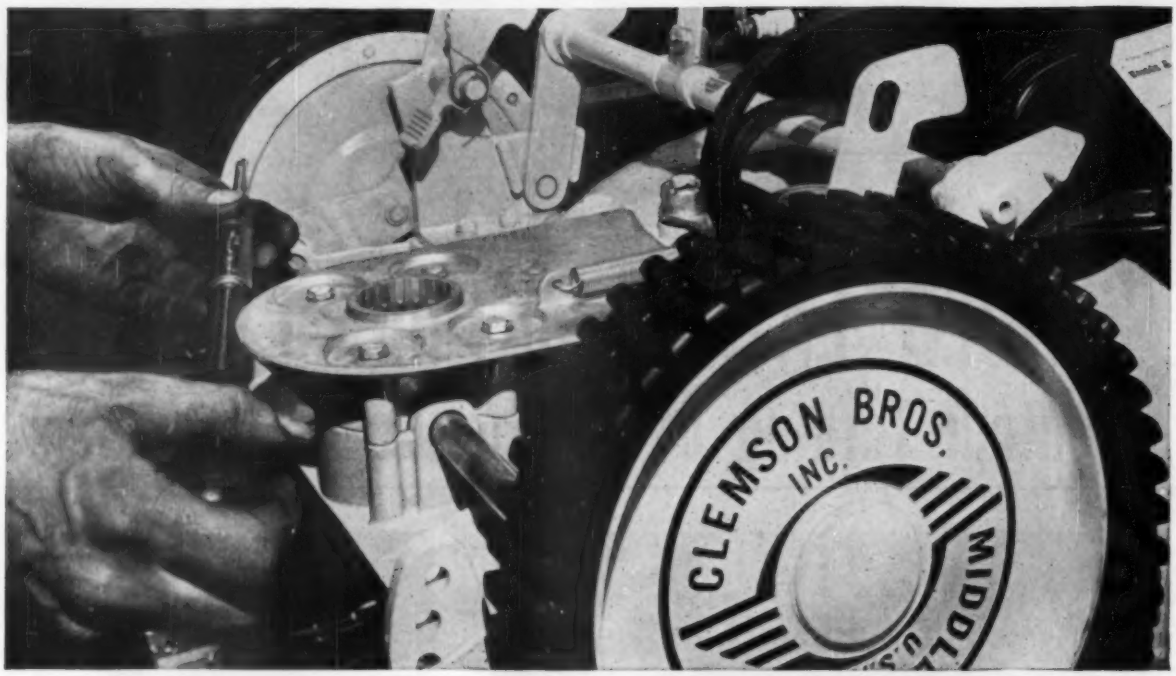
Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A BETTER TURN FASTER . . . TURN TO MONARCH

PARKER-KALON SELF-TAPPING SCREWS "MOW DOWN" ASSEMBLY PROBLEM FOR CLEMSON LAWN MOWERS



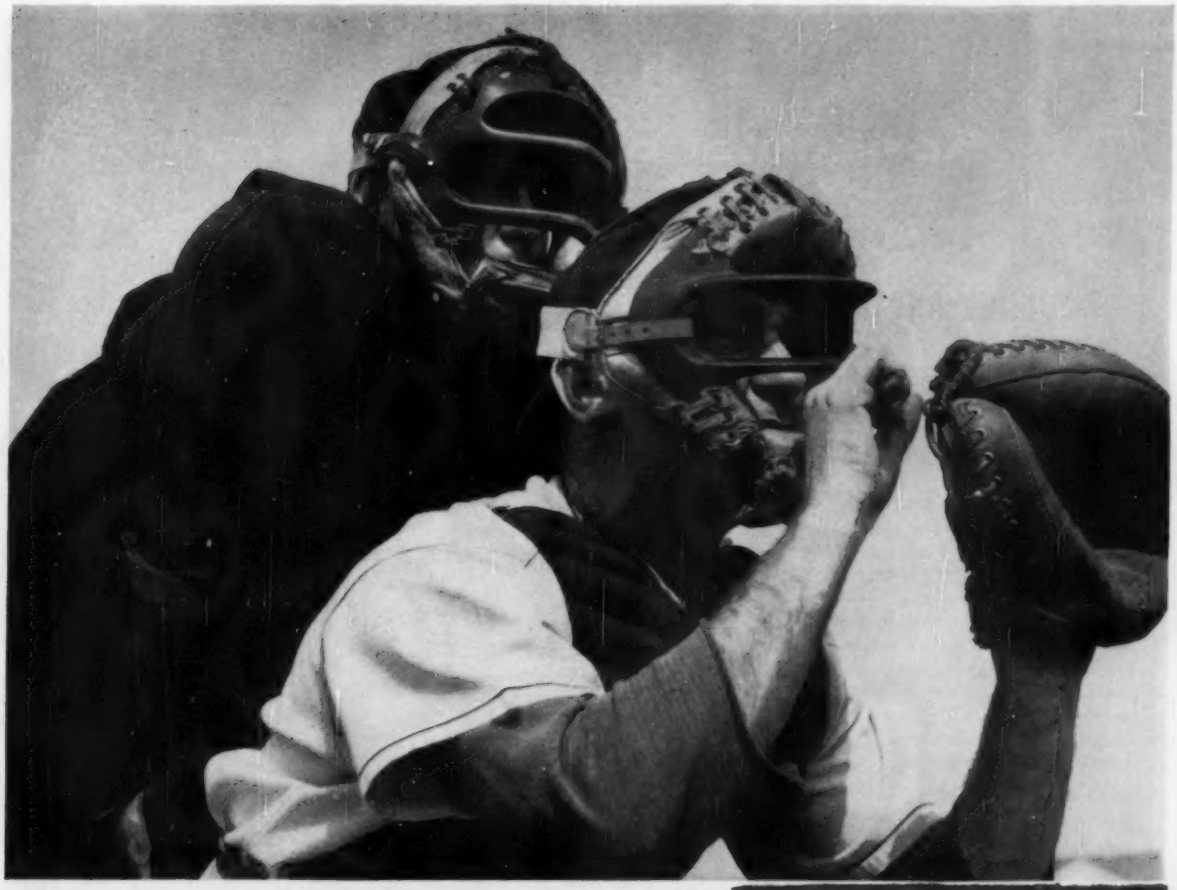
"Our problem," says Mr. Charles Kellogg, chief engineer, Clemson Lawn Mower Div., "was fastening an 8" plastic ring into a wheel rim to hold a protective cover. We needed a screw which would cut threads into a tough plastic—a fastening which would hold securely against vibration set up by the power unit. In addition, we had to consider an awkward drive angle and the danger of marring the finish.

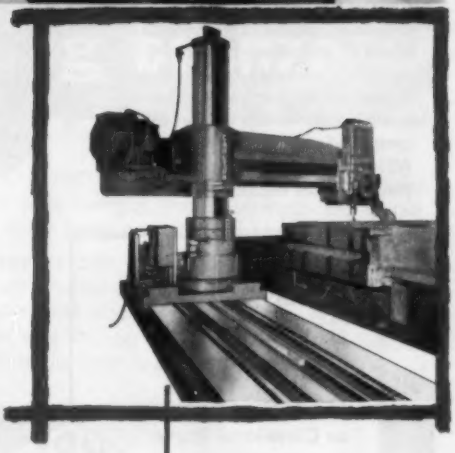
"The fasteners we were using couldn't measure up. So we replaced them with P-K Type F screws. They're working fine."

This is another example of how Parker-Kalon fits the screw to the job. Whatever the nature of your fastening problem, it will pay you to ask your nearby Industrial Distributor for complete information and P-K fastener samples.

PARKER-KALON®
fasteners

***PARKER-KALON DIVISION**, General American Transportation Corporation. Self-tapping Screws, Socket Screws, Screw-nails, Masonry Nails, Wing Nuts and Thumb Screws. Sold everywhere through leading Industrial Supply Distributors. Factory: Clifton, New Jersey—Warehouse: Chicago and Los Angeles.*





Specialists do the job better: they're on the ball

The fellows most on the ball are those who concentrate on one thing . . . and do it well. Carlton has concentrated on radial drill research, engineering and manufacturing since 1916. This close contact with—and intimate knowledge of industry's drilling requirements—has produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. Programming, pre-select, partial pre-select and manual speed-feed controls, plus special bases, tables and jigs available for additional productivity. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton

SPECIALISTS IN RADIAL DRILLS

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

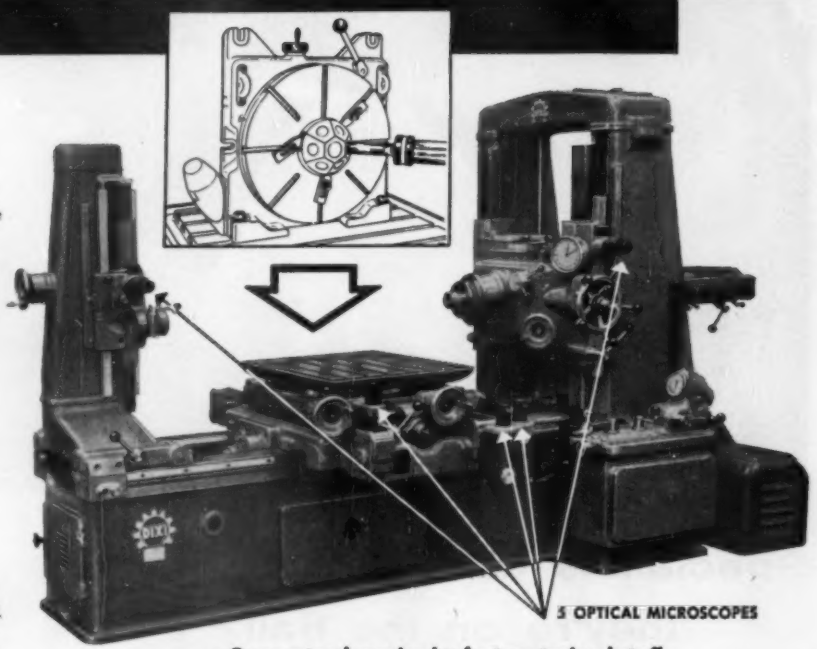
ACCURACY
Overall accuracy of .0002"

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



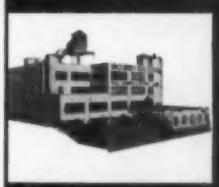
- ***Guaranteed service by factory trained staff***
- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request.

SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.



Our Headquarters in New York City

M.B.I.

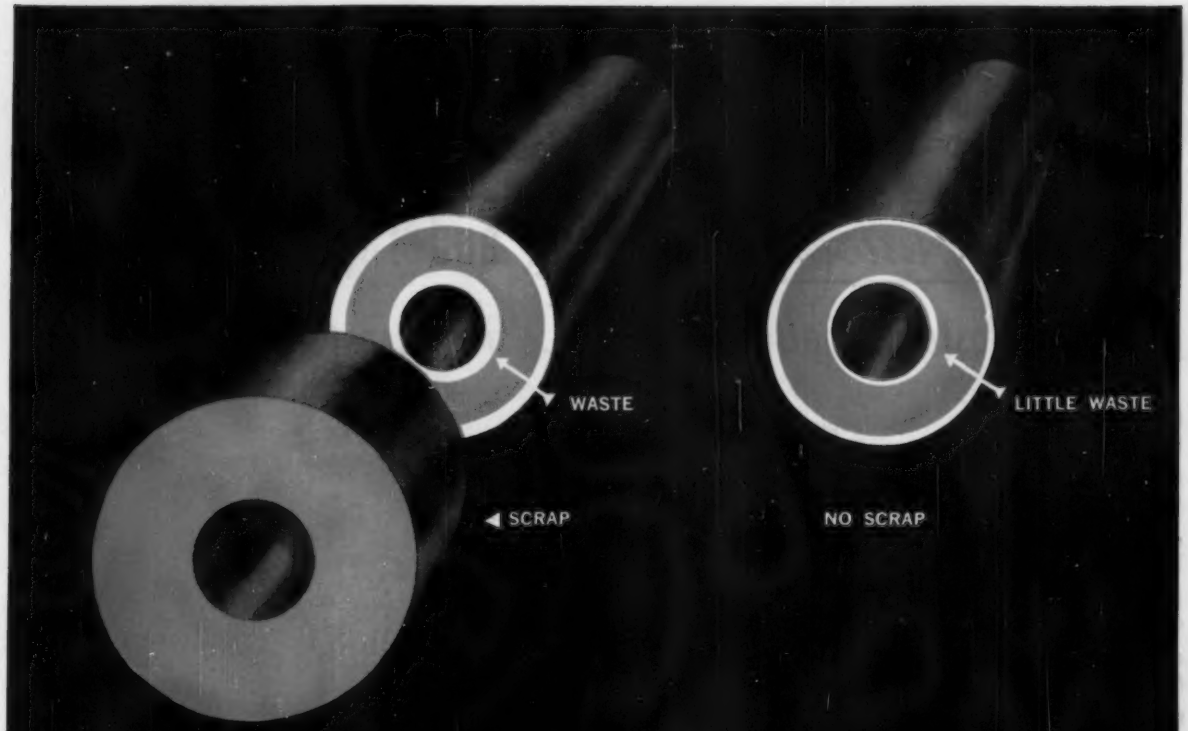
export & import ltd.

A Division of Machinery Builders, Inc.

475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing & building machinery"

Phone: MOtt Haven 5-0900



SAVE FIVE WAYS...
with Asarcon bearing bronze

❶ **Cut short-end scrap up to 48%!** Buy Asarcon 773 (SAE 660) and forget short-end scrap problems created by the standard 13" bar. You order Asarcon 773 in the **exact** length you need — all the way up to 105"! And you save on handling and inventory costs at the same time.

❷ **Save almost ⅓ on diameter losses!** Buy Asarcon 773 and instead of ¼" clean-up allowances, you have only 1/32" to 3/32" to machine. If you're currently using rough-cast bars, you may now be throwing away ⅓ the metal you buy! (Not to mention the waste if you buy solid bars and bore them out!)

❸ ❹ ❺ **Save these three other ways:** Buy Asarcon 773 and you save on machining time, since there's far less metal to remove. Buy Asarcon 773 and you get better service and longer life from your bearings — there are no blow-holes, pits, shrinks, sand or other foreign matter to cause trouble. Buy Asarcon 773 and you save on down-time — because you get greater yield strength, impact strength and fatigue strength than in the same alloy cast by any other method!

In short, buy Asarcon 773, and watch bearing costs tumble! For more information, talk to your local independent Asarco distributor, who stocks Asarcon 773 in 260 sizes of solids and tubes — or write us directly, and we'll demonstrate how others are saving with Asarcon 773.

ASARCO

Continuous-Cast Products Department

AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana

WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna St., San Francisco IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

CLEEREMAN

"Series A" *Automatic* Drilling and Tapping Machines

producing faster... better... easier... from coast to coast!

Hartford, Conn.
Pratt & Whitney Aircraft

Midland Park, N. J.
Marlow Pumps Division

Reading, Pa.
Textile Machine Works

Syracuse, N. Y.
Carrier Corporation

Cortland, N. Y.
Brewer-Titchener

Barberton, Ohio
Ohio Brass Co.

Cleveland, Ohio
Eaton Mfg. Co.

Cleveland, Ohio
Fawick Corporation

Marion, Ohio
Eaton Mfg. Co.

Highland Park, Mich.
Ford Motor Co.

Jackson, Mich.
Calvin Machine Products, Inc.

Saginaw, Mich.
Saginaw Steering Gear Division, General Motors Corporation

Chicago, Ill.
Ford Motor Co., Aircraft Engine Division

Libertyville, Ill.
The Frank G. Hough Co.

Morton Grove, Ill.
Bell and Gossett Co.

Springfield, Ill.
Allis-Chalmers Mfg. Co.

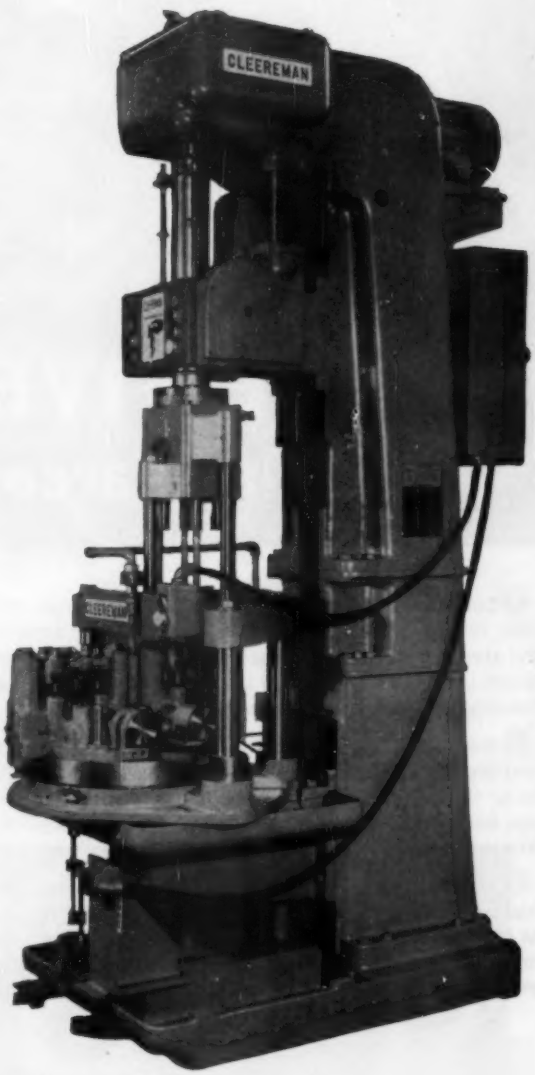
West Allis, Wis.
Allis-Chalmers Mfg. Co.

Tulsa, Okla.
Aero Parts Mfg. Co., Inc.

Omaha, Neb.
Omaha Production Co. Division, Vickers, Inc.

San Francisco, Calif.
Chas. M. Bailey Co.

South San Francisco, Calif.
Smith-Blair Co.



These are a few of the Cleereman "Series A" users who find this "box cycle" automatic Drilling and Tapping Machine the answer to their problems.

Drilling and tapping a hole "at the touch of a button" produces faster, easier and at highest profits. Operators are relieved of handling cumbersome controls. Operator morale is boosted and operator fatigue reduced.

Join the rapidly increasing Cleereman "Series A" users list. This fast set-up production-type drilling and tapping machine has a place in your plant. Don't delay increasing your production efficiency. *Wire, write* or *phone* about your jobs right now.

BRYANT
Machinery & Engineering
• Company •
General Office
555 West Washington Blvd., Chicago 6
Representatives in Principal Cities

CLEEREMAN MACHINE TOOL CORP.
GREEN BAY, WISCONSIN

Service for you

PDQ

from your SIMONDS INDUSTRIAL DISTRIBUTOR

Products Grinding wheels, mounted wheels, abrasive segments, abrasive grain . . . for efficient, low cost performance! *Your Simonds distributor is a "single" supply source for all.*

Deliveries Speedy supply from complete 'local' stocks. Instant net price quotation on any quantity of Simonds wheels. *Your Simonds distributor is as near as your phone.*

Quality Established, proven product quality! This is the basis on which your distributor selects all his stocks . . . and the reason why *your Simonds distributor offers you service that saves.*

SIMONDS ABRASIVE COMPANY

Tacony & Fraley Sts., Philadelphia 37, Pa.

DIVISION OF SIMONDS SAW AND STEEL CO.

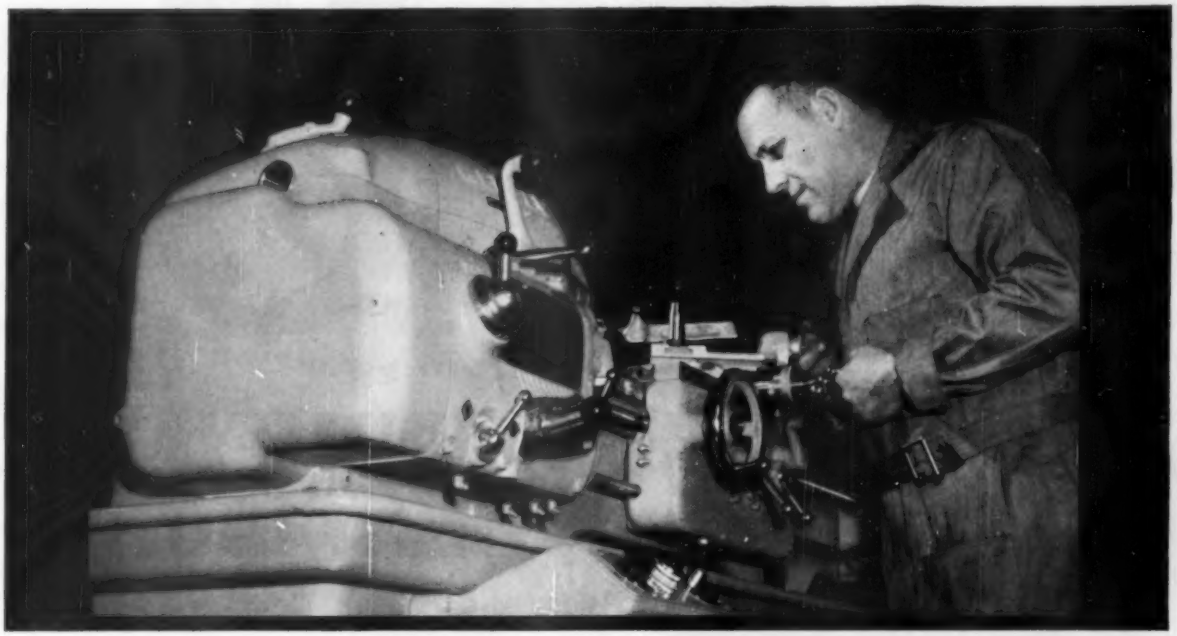
BRANCHES: PHILADELPHIA • CHICAGO • DETROIT • LOS ANGELES
SAN FRANCISCO • PORTLAND, ORE.

You get

top value per dollar

with a Hendey 9" Lathe

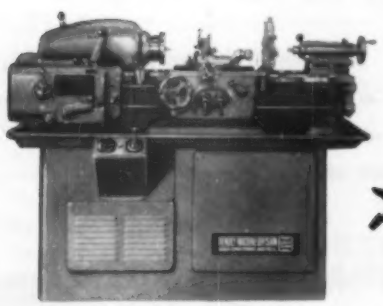
efficient operation on precision, high-speed lathe



Looking for a high-precision lathe with speeds that take advantage of carbide tooling? If you are — take a good look at the Hendey 9-in. x 24-in. tool and gage-makers' lathe. Compare it with any other lathe in its class on moderate-run production jobs, as well as on the toolroom operations where its reputation was made.

Maximum operator convenience is assured by compact control grouping. Carriage, slide, and compound combine precision with rigidity in machine's construction.

Spindle speed — infinitely adjustable from 15 to 3000 rpm — may be changed smoothly and easily while under load. Rapid stopping of the spindle, even while operating at maximum speed, means shorter floor-to-floor times since there is no waiting for machine to coast to a stop. Efficiency can be improved further on many production turning jobs by using optional accessories like the four-way tool block and taper attachment. Ask your nearby Hendey dealer about the complete facts and features.



for precision with production buy Hendey

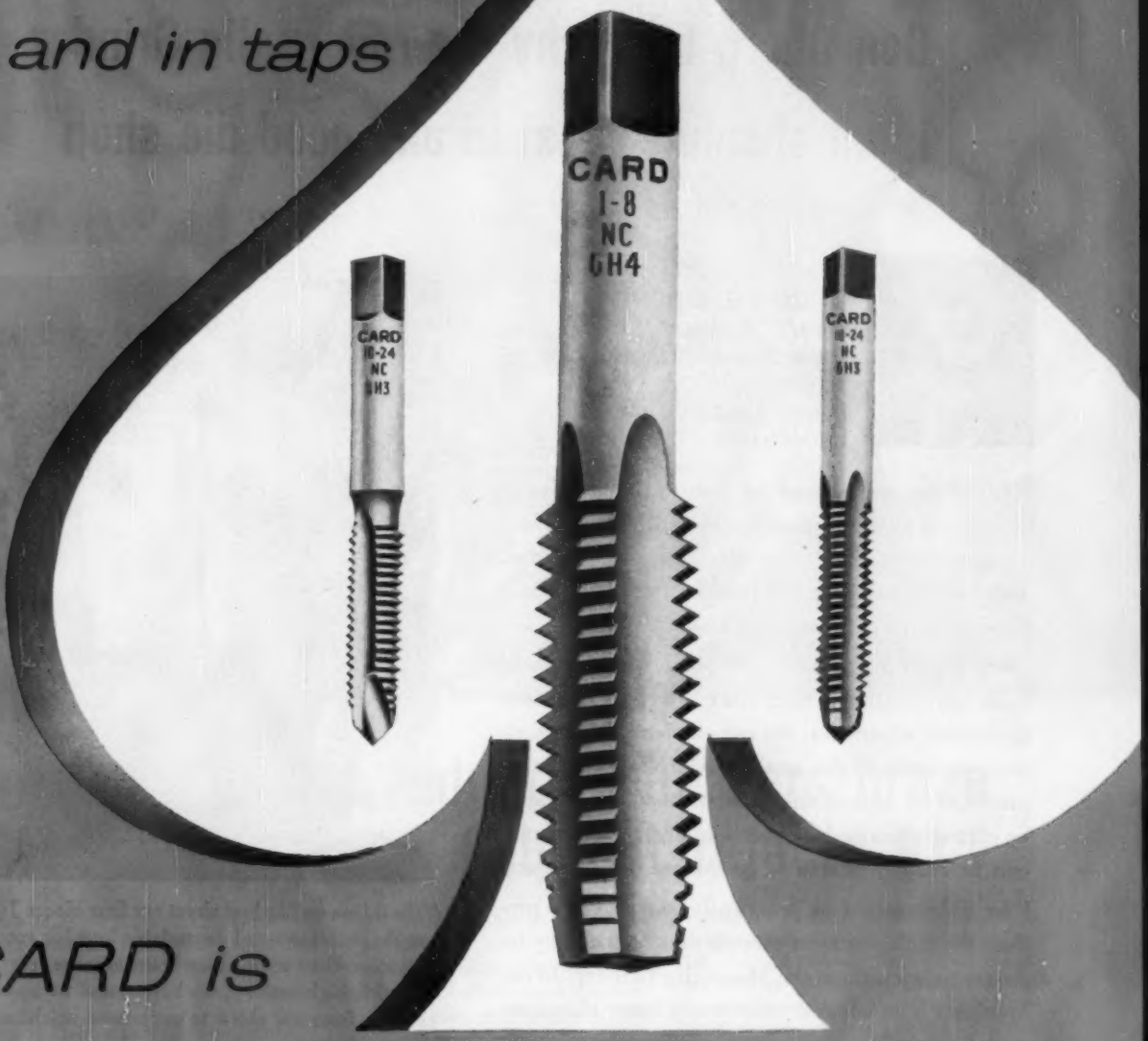
Hendey **machine division**

BARBER-COLMAN COMPANY

61 Loomis St., Rockford, Illinois

BARBER COLMAN ®

...and in taps



CARD is

ACES with OPERATORS

Operators busy at many different tapping applications will tell you that Card taps can be depended upon for precision performance and long life — on job after job. And shopmen are sure of getting uniform top quality in gages as well as taps, every time they use these popular Card tools. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through fine distributors from Coast to Coast

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of
Carbide Dies

"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

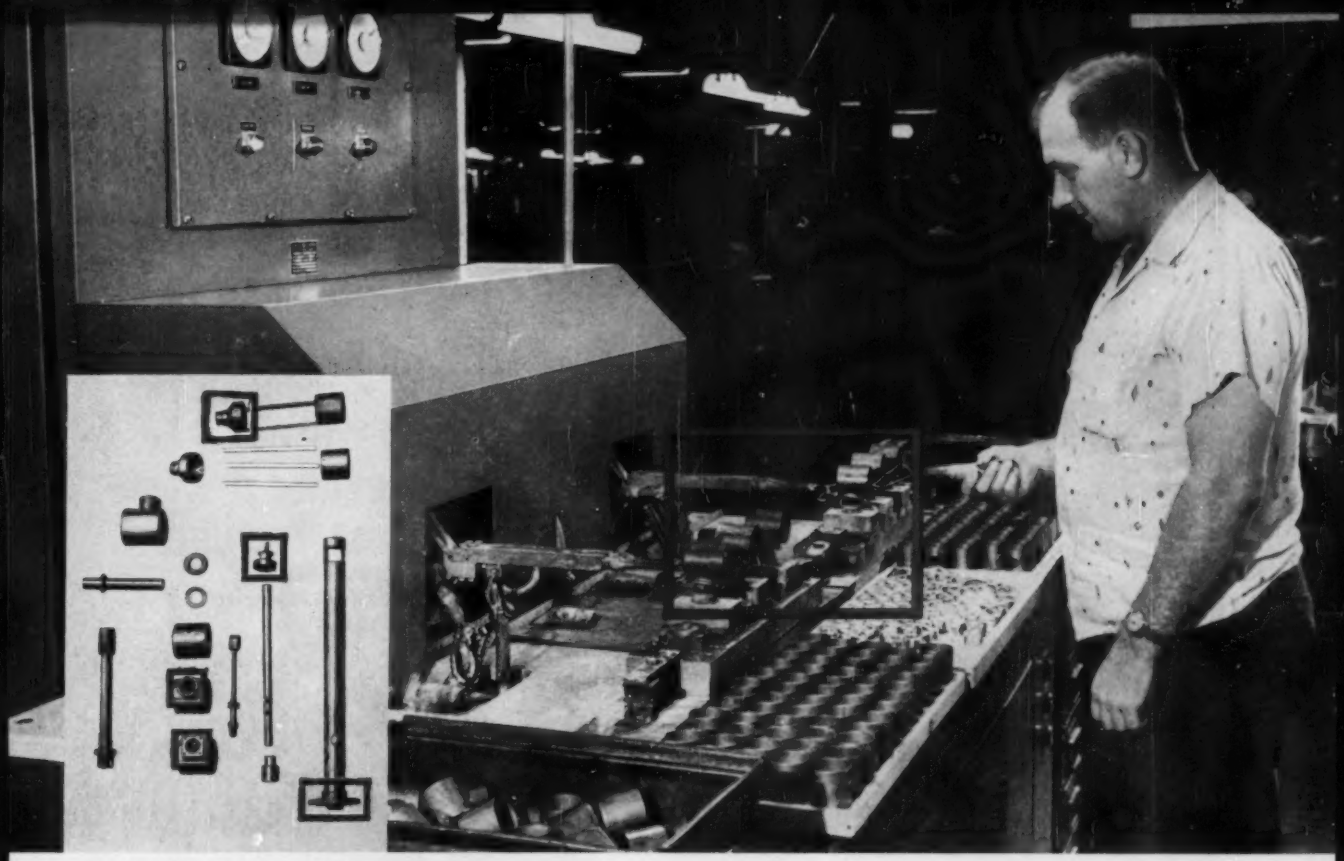
MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Connecticut

"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES



AT HARTFORD MACHINE SCREW CO.—

General Electric induction heaters braze 20 different parts, help cut rejects 91%

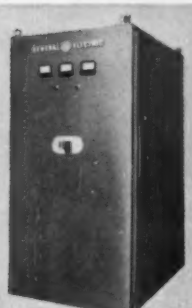
At Hartford Machine Screw Co., a General Electric electronic induction heater is used for brazing a wide variety of parts for electric-switch housings and jet engines.

The General Electric unit takes on jobs ranging from ¼-inch to 1½-inch tubing. After brazing, each part undergoes a regular 500-pound pressure test, and the aircraft work must pass radiographic inspection. With the General Electric induction heater, rejects have been reduced 91 per cent, from 30-35 per cent to a maximum of two per cent.

"If we need another induction heater, it definitely will be a General Electric," says A. O. Haversat, plant engineer. "The output control alone makes it virtually a MUST. This feature is just what we need for our kind of production. It eliminates guesswork and costly human errors. And it cuts out excess tooling, while still assuring uniform brazing."

General Electric electronic induction heaters are available in four ratings—7½-15-, 25-, and 40-kw, with a choice of four different models in each rating. The four models provide various control combinations, so you can buy the one induction heater which best matches your production pattern from the standpoint of both rating and control.

For more information, send in the coupon below or contact your nearby General Electric Apparatus Sales Office.



Four models in each of four ratings; 7½ Kw, 15 Kw, 25 Kw, and 40 Kw.

General Electric Co.
Section 722-6
Schenectady, N. Y.

PLEASE SEND ME A COPY OF BULLETIN GEA-6388

NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____

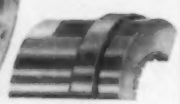
GENERAL ELECTRIC

HARDINGE
ELMIRA, N.Y.

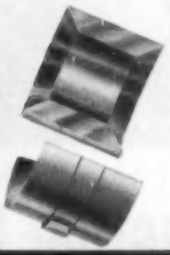
STANDARD EQUIPMENT in Progressive Screw Machine Plants

The Only MASTER COLLET With No Work Pressure on the Screw.

Style "S"
Master Collets and Pads



Pads Interchangeable Among Different Makes of Automatics



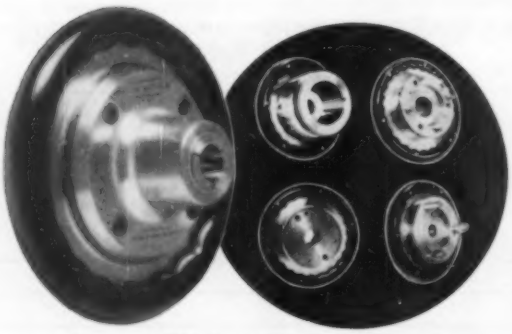
Style "B"
Master Feed Fingers and Pads

HARDINGE BROTHERS, INC., Elmira, N. Y.

Write for Style "S" Bulletin and Style "B" Bulletin

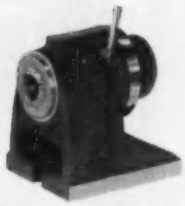
HARDINGE-SJOGREN Speed COLLET CHUCKS

Fast — Accurate
Increase Production Capacity

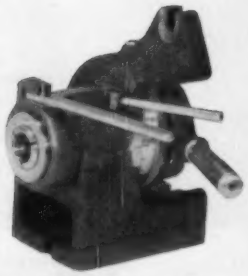


Available in 1 1/16"; 1 3/8"; 2 1/4"; and 3 1/2" collet capacity. Threaded nose, cam lock, tapered key-drive and American Standard spindles. *Write for Bulletin 8A.*

HARDINGE BROTHERS, INC., Elmira, N. Y.



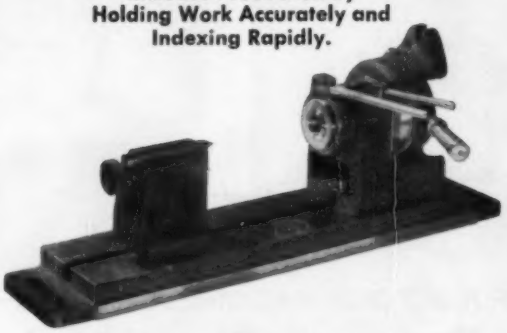
H-4 Tool Room-Inspection



HV-4 Production

HARDINGE COLLET INDEX FIXTURES

Increase Production by Holding Work Accurately and Indexing Rapidly.



HARDINGE BROTHERS, INC., Elmira, N. Y.

Write for Bulletin CF5

HARDINGE
ELMIRA, N.Y.

COLLETS for LATHES and MILLERS

ACCURACY — DURABILITY — LOW COST

Write for Bulletin 56 — Complete collet ordering information for all Lathes, Millers, Grinders and Fixtures

HARDINGE BROTHERS, INC., Elmira, N. Y.

Immediate stock delivery from Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, Minneapolis, New York, Philadelphia, San Francisco, St. Louis.

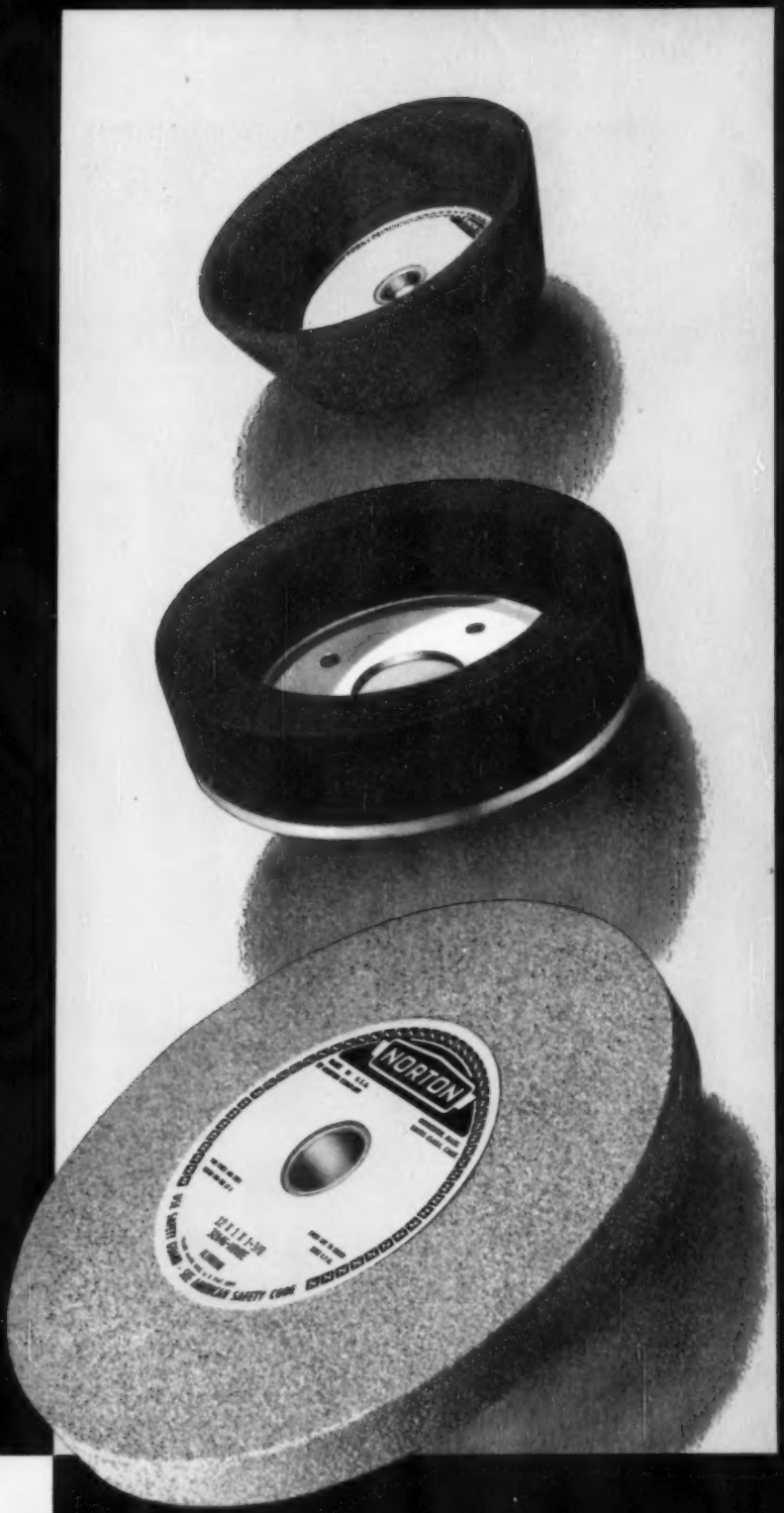
NORTON

IS NUMBER

1

IN ABRASIVES

throughout the world!



Number **1** in Supplying
he Abrasives You Need
for Your Work

Making better products...
to make your products better

NORTON

IS NUMBER 1

IN ABRASIVES

throughout the world!

In Product Variety
— a complete line of grinding wheels and abrasives to meet *all* your grinding and finishing requirements.

In Engineering Service
— skilled abrasive engineers the country over to help you solve your grinding and finishing problems.

In Customer Service
— distributor stocks in over 315 cities, large warehouse stocks in five cities, immense factory stocks — all backed by the production facilities of the world's largest grinding wheel plant.

In Abrasive Research
— over 180 scientists and technicians in specialized laboratories using the very latest scientific apparatus developing new and improved abrasives and bonds to cut your grinding costs.

NORTON COMPANY • WORCESTER, MASS.

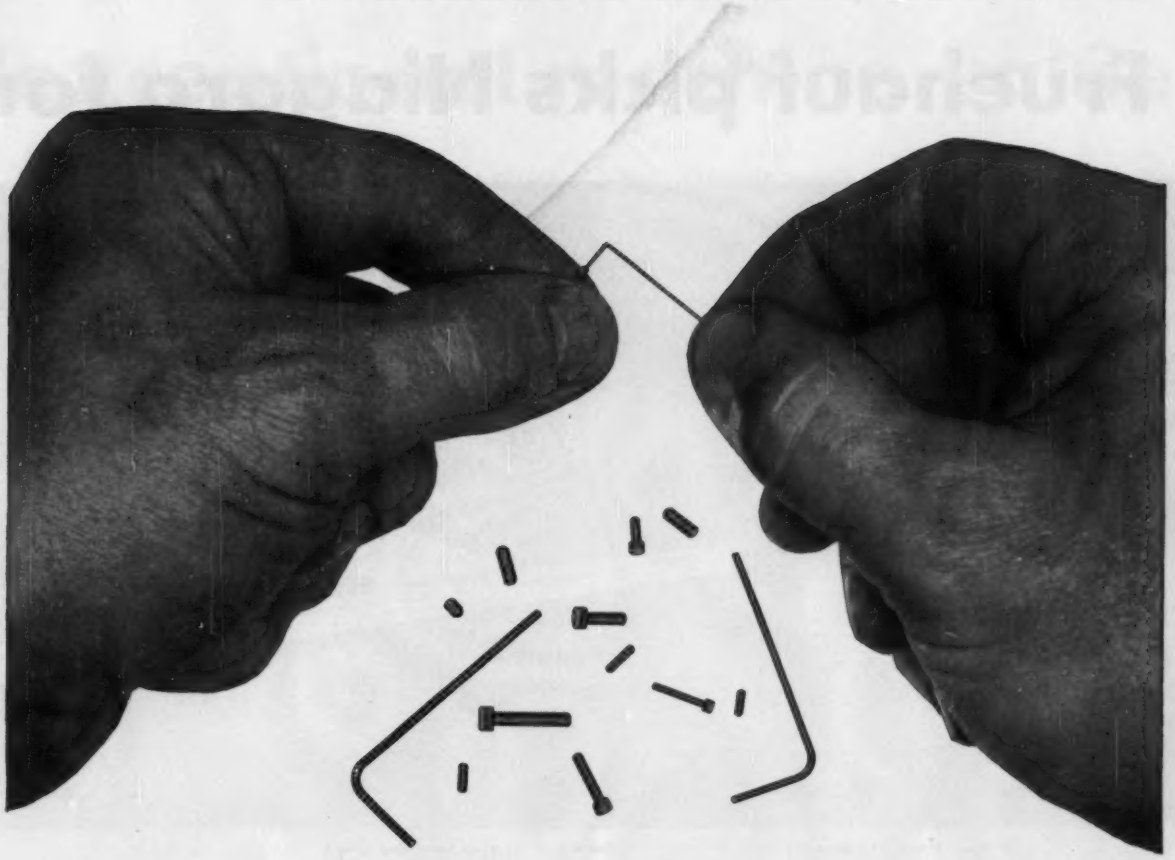
General Offices: Worcester 6, Mass.
Grinding Wheel Plants: Worcester, Mass., and Santa Clara, California

District Offices: New York Area (Teterboro, N.J.) • Philadelphia* • Pittsburgh* • Chicago* • Cleveland* • Detroit* • St. Louis • Hartford • Los Angeles Area (Huntington Park)
**Warehouse Facilities and Stocks at this location*

Plants and distributors around the world

BEHR-MANNING CO., Troy, N.Y. is a division of Norton Company

5-57



If you're miniaturizing . . . you'll save space, time and money with Allen Minicaps and Minisets (#0 thru #3 dia.)

These miniature Allen Hex Socket Cap and Set Screws will let you scale down your product sizes even farther. They're made from Allenoy special alloy steel — so strong that you can safely specify fewer screws or smaller sizes.

Allen Minicaps and Minisets are tiny, but very tough! — true Allens, with deep, clean, strong sockets and uniform Class 3A threads. Minicaps have the Allen knurled "Grip-Head" and are trimmed both on top and *under* the head, for tighter fit and better appearance. Minisets have the improved small-cup Allenpoint that drives deeper and holds tighter.

Because sockets are uniformly true hexagon shape, the key or driver fits tight — makes starting much easier, saves a lot of time in assembly.

Diameters of these miniatures run from #0 through #3. Minicap lengths run from 1/8" through 1/2", and Miniset lengths from 1/16" through 1/4". Also standard in stainless steel. Your Industrial Distributor has them now. He'll show you why these Allens — like all Allens — hold tighter and last longer. Or write for information and samples.

Use Minicaps and Minisets wherever you need dependable fastening in very small assemblies:

TV, radio and telephone equipment • Guided missiles, rockets • Panel meters • Electro-mechanical devices and servo-systems • Computers • Control and operating mechanisms for relays • Cameras • Instruments

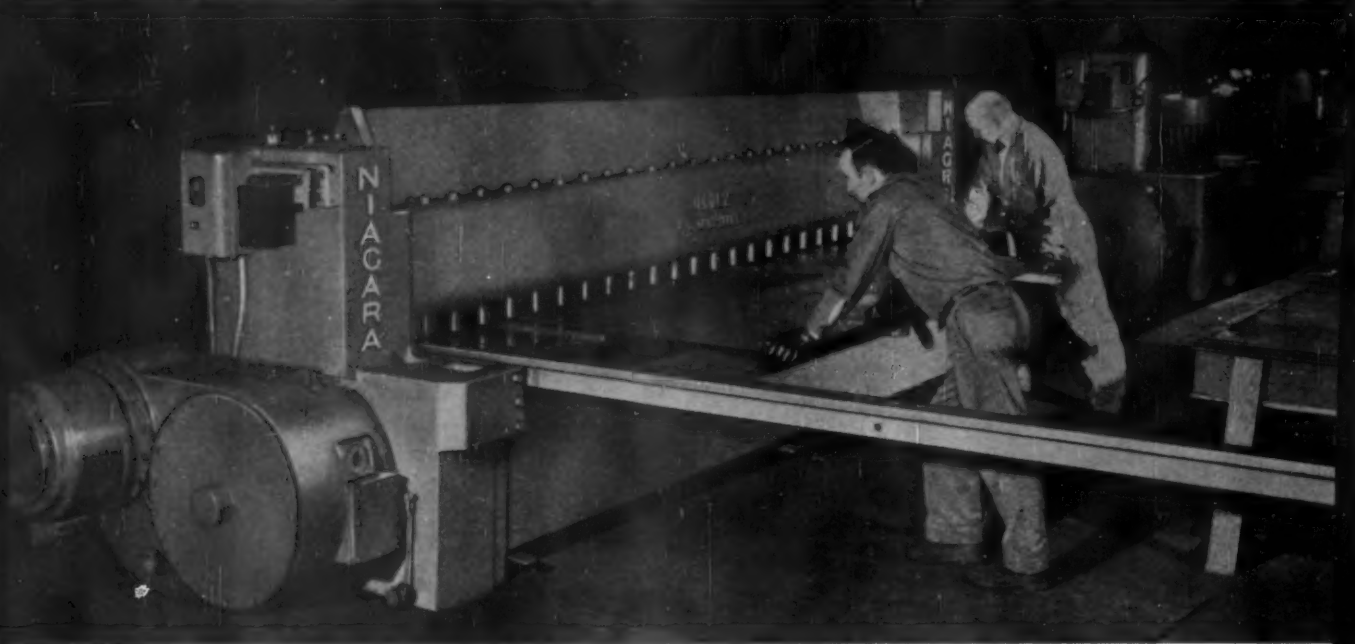
Stocked and sold by leading industrial distributors everywhere

ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

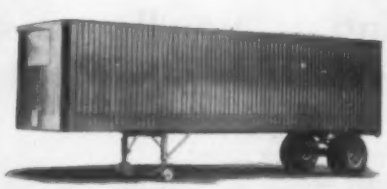
ALLEN HEX-SOCKET SCREWS HEAD

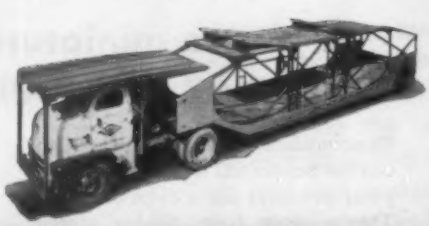
IN POWER SQUARING SHEARS...

Fruehauf picks Niagara for



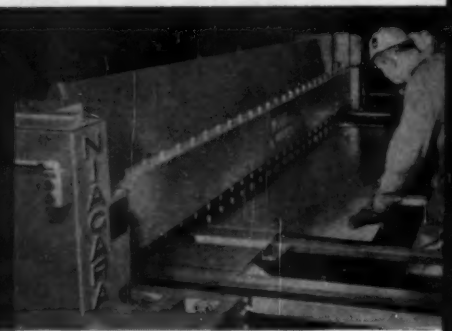
Niagara Model 912 shearing 18" x 30" transition plates from 10 gage hot-rolled steel for tank trailer frames.





Niagara Model 96 cutting forty 4" x 6" trailer gussets per minute from ⅜" and ½" bar stock.

Niagara Model 812 shearing 11 gage hot-rolled steel to 36" x 144" for trailer floor beams.



Niagara Model 812 at work shearing 24 gage stainless steel to 4' x 6'6" for van trailer door panels. Production: 2.7 pieces sheared all 4 sides per minute.

NIAGARA power squaring shears

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

"exceptional machine value"

World's largest trailer manufacturer spells out its reasons for using Niagara Underdrive Shears in producing a wide variety of parts from cold-rolled and hot-rolled steels, stainless and aluminum

As a metal fabricator, Fruehauf Trailer Company is well-qualified to speak. It not only manufactures every conceivable type of commercial trailer, but "builds more of them than any company in the world."

So, when it comes to power squaring shears, Fruehauf is particularly qualified to speak. Using several Niagara Models, it considers them an "exceptional machine value."

Enlarging on the point, Fruehauf engineers say, "Niagara Shears are capable of holding straight lines within thousandths of an inch . . . they keep their settings . . . trouble-free, they require a minimum of maintenance.

"They're well-balanced . . . can be moved about . . . require no special concrete base. We especially like their minimum height . . . can see over them. It's unlikely that an operator will step out from the shear in the path of a fork lift."

Like Fruehauf, progressive companies everywhere look to Niagara for exceptional machine value in a power squaring shear. Here are a few of the reasons:

TAKE ACCURACY! Niagara's positive, power actuated, self-compensating holddown grips work securely. Fully closed box section construction of bed, crosshead, holddown and housings resists all stresses with minimum deflection.

TAKE SPEED! More working strokes per minute and instant engagement of Niagara's exclusive multi-point sleeve clutch assure more cuts per hour. Full visibility of the cutting line, ease of operation, quick setting gages and safety features boost hourly output.

TAKE MAINTENANCE! Niagara Shears are built to stand the gaff on the toughest jobs. Simplicity of design involving a minimum number of parts, and utmost accessibility cut out costly maintenance.

Any way you look at it, Niagara has the most to offer you in modern shear performance.

NIAGARA'S NEW, FACT-FILLED BULLETIN WILL GIVE YOU THE FULL STORY

74 Pages — 141 Illustrations . . . Most Comprehensive Shear Bulletin Ever Published . . . 19 Photo Reports of Niagara Shears In Action . . . 44 Revealing Views of Niagara Shear Features . . . Easy-to-read Specs For America's Most Complete Underdrive Line (59 Models, Capacities: 16 gage to 1", Cutting Lengths: 4' to 20')

CLIP THIS COUPON FOR YOUR COPY TODAY!

see what America's most modern power squaring shears can do for you

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

MAIL your new Underdrive Squaring Shear Bulletin 69G to us immediately.

NAME _____ TITLE _____

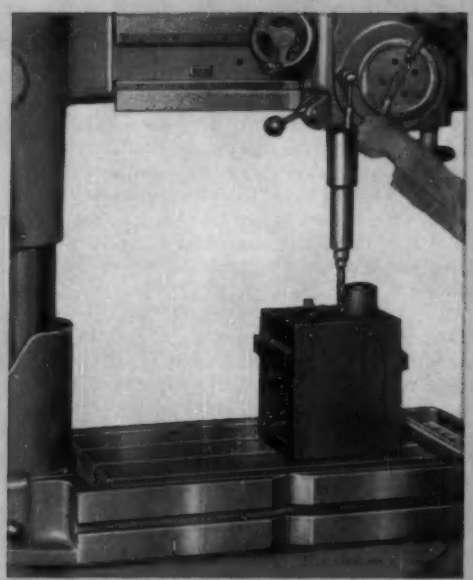
COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

AM

SMALL WORK



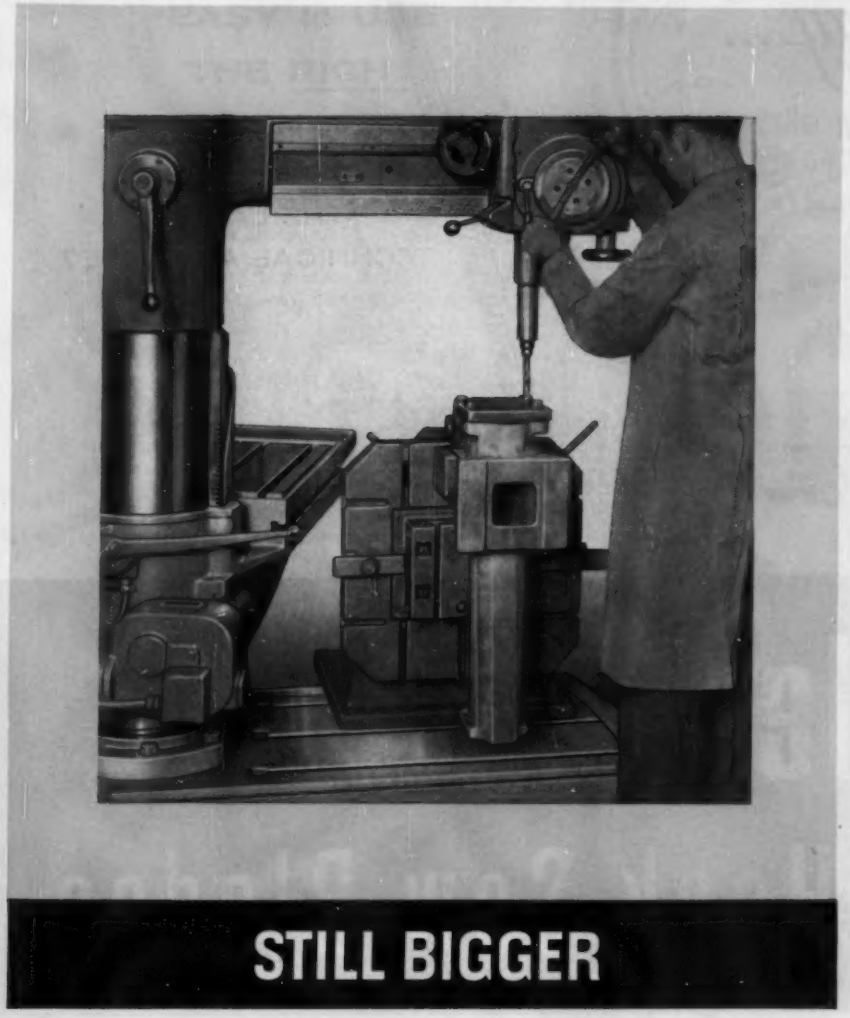
BIGGER...

FOSDICK SENSITIVE RADIAL DRILLS

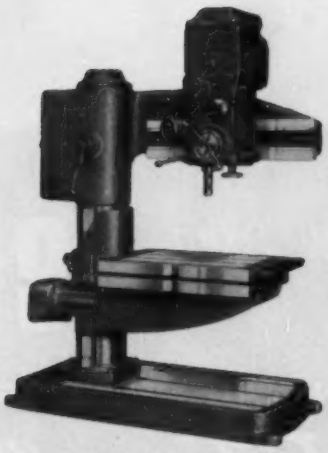
sensitive to your

We put a table on the radial to give you two machines in one—and a work size versatility that is unmatched in any drilling machine of comparable price and size!

Actually, the Fosdick Sensitive Radial combines the best features of two proven, reliable designs. The capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. For job shop work or production, it's the answer to useful capacity in limited floor space. Economically priced, too! The economy of first cost is second only to the economy of use.



STILL BIGGER



ALL THESE WORK SIZES ON ONE MACHINE— The Fosdick Sensitive Radial Drill. Also available as a Layout Machine, which combines high precision compound table with sensitive radial drill.

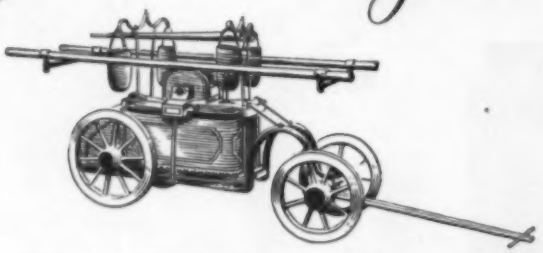
work size problem...and your pocketbook

Ask for Bulletins SRA and LMA.

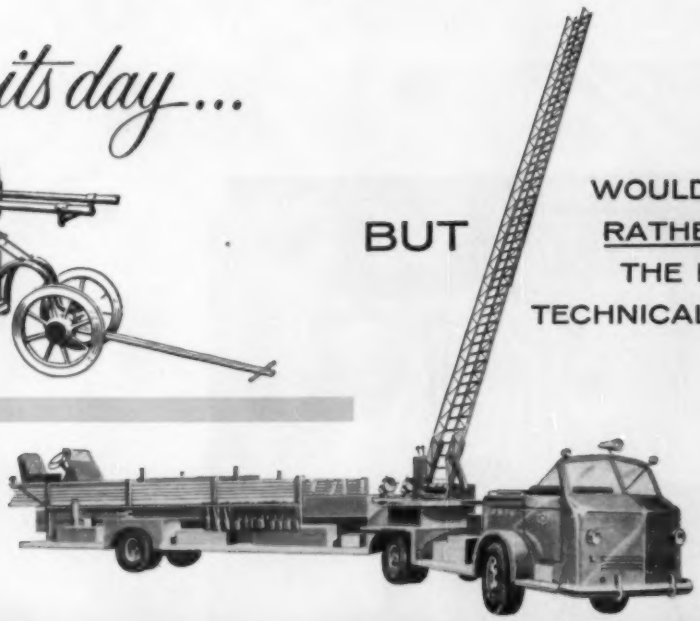
The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, or on the base with the table swung out of the way. Drills up to 2″ in cast iron. 12″ column, 3′ or 4′ arm, nine speeds (ranges from 60-1200 to 175-3500 rpm), four feeds (.004-.020 or .002-.010), 3 hp motor, reversing motor control for tapping.

Write today for complete information on the Fosdick Sensitive Radial Drill.

Great in its day...



BUT WOULDN'T YOU RATHER HAVE THE LATEST TECHNICAL ADVANCE?



Now from **Heller** *A great new advance that lowers metal cutting costs*

HAND AND POWER

"Job Tempered" Hack Saw Blades

Certified by American Standards Testing Bureau* to meet their standards for superior cutting: Uniform Teeth, Uniform Set, Uniform Temper

Clean, efficient, *lowest cost* cutting can only be obtained from *uniform*, consistent quality blades such as produced by Heller's unique, Job Tempering process.

In Heller Job Tempered hand and power blades, uniformity begins right with the raw steel which is made to specification and minutely inspected for analysis and proper grain structure. Teeth are *milled* to uniform size, shape and spacing by the most modern, highly specialized equipment in the industry. Uniformity of tooth set is precisely measured with an indicator specifically developed for this purpose.

Then Heller's unique heat treating technique, *carefully matched to the metallurgy of the steel*, brings about exceptional uniformity of temper the full length of the blade — and from one blade to the next.

That's why *every* Job Tempered hand or power hack saw is certified by American Standards Testing Bureau to meet their standards for superior cutting: uniform teeth ... uniform set ... uniform temper — your assurance of outstandingly better, *lower cost* service on the job.

SOLD EXCLUSIVELY THROUGH

Heller DISTRIBUTORS

"YOUR OUTSIDE TOOL ROOM"

Heller "Job Tempered" Tools

* AMERICAN STANDARDS TESTING BUREAU INC. S T B

HELLER TOOL CO. SINCE 1836

Heller

HELLER TOOL CO., *America's Oldest File Manufacturer*
Newcomerstown, Ohio — A Subsidiary of Simonds Saw and Steel Co.

IT'S EASY to CHOOSE
EASY to USE
THE RIGHT
HELLER BLADE

FULL LINE OF HAND AND POWER BLADES

There's a right Job Tempered Blade for your hand frame or power hack saw in Heller's complete line.

HAND BLADES

Supplied in Standard Steel, High Speed "M"-Hax and High Speed "T"-Hax Steels. 10" and 12" lengths to fit all standard frames. Tooth spacings of 14, 18, 24, and 32 teeth per inch. Hard-Edge flexible blades for general use or the All-Hard preferred by skilled operators.

POWER BLADES

Available in High Speed "M"-Hax and "T"-Hax Steels and in "Nuweld" shatterproof type for maximum safety. Lengths from 12" to 36" for all machines. Tooth spacings 2½ to 18 teeth per inch for cutting most materials.

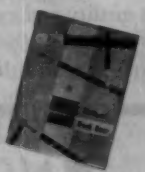
HOW TO SELECT AND USE THE RIGHT BLADE

Your Heller Distributor has handy Wall Selection Charts to help you choose the *right* blade for the job, and a valuable booklet, "Heller Hints on Hack Saws" that help you get long life, top performance and the lowest cutting costs you've ever experienced!

GIVE US YOUR TOUGHEST HACK SAWING PROBLEM

We'll show you how the *right* Heller Job Tempered Blade can solve it and deliver faster, smoother, trouble-free cutting over longer periods than ever before.

HERE ARE THE FACTS:



New Heller Hack Saw Catalog gives full information on sizes and types of blades offered.

WRITE FOR YOUR COPY TODAY

nucut

FLAT GROUND DIE STEEL

METAL CUTTING BAND SAWS

FAMOUS HELLER FILES

A big step forward in barrel finishing

Improved ALUNDUM TUMBLEX* "A" abrasive brings you many new "Touch of Gold" advantages*

The new Norton TUMBLEX "A" abrasive has exceptionally long life . . . great resistance to wedging in work-piece crevices . . . adds attractive lustre . . . and can handle the widest variety of parts.

It performs several operations at once — removing flash, scale, tool marks and burrs, while forming radii and finishes to the required microinch.

It is also better sized, more uniform in shape and available in a wider range of sizes.

SIZES NOW AVAILABLE

No.	Size	No.	Size
00	1 ½" to 2"	3½	5/16" to ¼"
0	1" to 1 ½"	4	3/32" to 5/16"
1	⅝" to 1 ¼"	5	3/16" to ¼"
1½	1 1/16" to ⅝"	6	⅛" to 3/16"
2	7/16" to ¾"	8	1/32" to ⅛"
2½	½" to 7/16"	10	standard 10 mesh
3	⅜" to ½"	12	standard 12 mesh

Every one of these sizes has the advantages that will increase the value of your finished parts and cut the costs of your general barrel finishing. That's how improved TUMBLEX "A" *abrasive will step up your profit-boosting "Touch of Gold" to a new high.*

Send Your Work Samples

to our enlarged Sample Processing Department — and include a finished piece. We will barrel finish the samples with new TUMBLEX "A" abrasive — or any other Norton tumbling abrasive that may be more suitable — and return full information telling you exactly how you can improve product quality and cut finishing time and costs. NORTON COMPANY, *General Offices,* Worcester 6, Mass. Plants and distributors around the world.

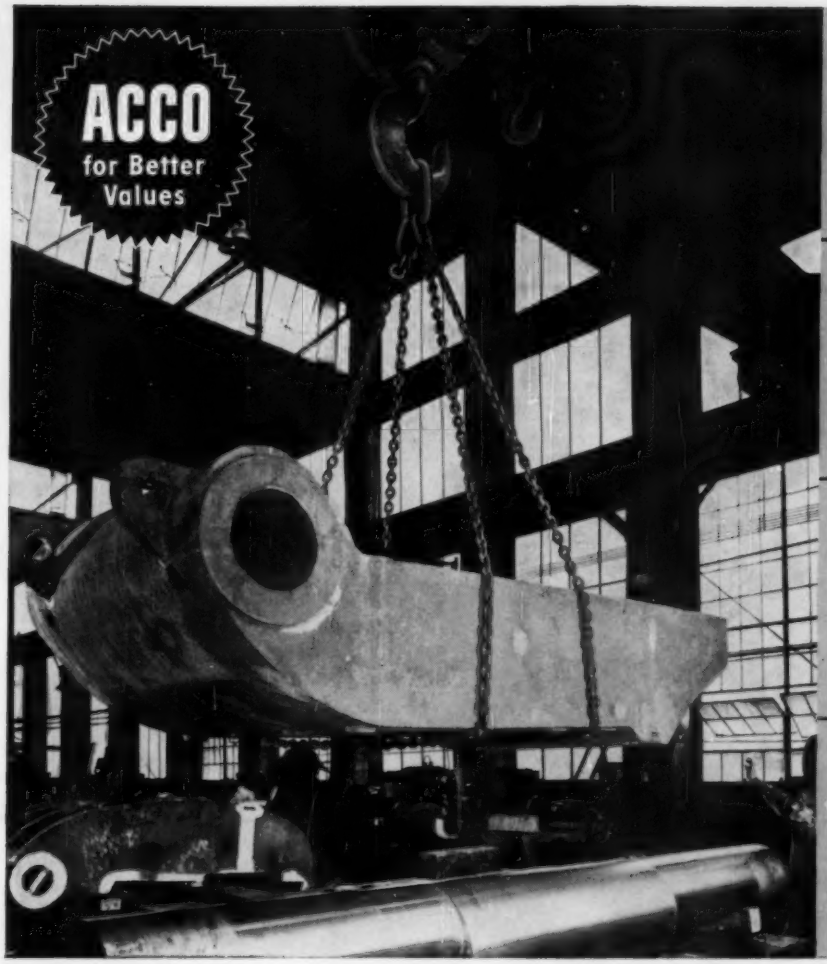
G-310

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

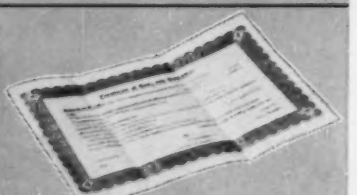
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



Accoloy X-weld 125 Chain
Pat. No. 2763768

New Shaped Master Link

ACCO Registration Ring



Registration Certificate

Big, costly loads are safe with Acco Registered® Sling Chains

• Pictured above is a huge, 35,000-pound casting being lifted *easily and safely* by a 4-leg ACCO *Registered* Sling Chain. Directly beneath the load is a highly polished and machined crank shaft worth many thousands of dollars.

Imagine the cost in lost labor and materials, should the sling chain fail! But it won't fail—for this ACCO *Registered* Sling Chain and all its components have the inbuilt strength needed to handle the job with complete safety!

When you buy an ACCO *Registered* Sling Chain, you get these four exclusive "plus values" which *add materially to the worth, but not to the cost,* of the sling:

1 • **Accoloy X-weld 125 Chain**, for extra strength. This chain hangs straight . . . does not kink . . . has extra resistance to bending.

2 • **New Shaped Master Link**, uniquely shaped to withstand deformation under loads up to 18% greater than a round-section link can do.

3 • **ACCO Registration Ring**, serially numbered as evidence that the assembled sling has been factory proof-tested to twice its working load limit.

4 • **Registration Certificate**, signed by us, attesting to the field-tested design and proof-testing of the complete sling.

Remember, the best sling is one of your most economical material-handling tools. You'll find it good business to consult your ACCO *Registered* Sling Chain Distributor on all your sling needs; his counsel is available without obligation. If you don't know his name, write us at York, Pa.

WHAT "ACCO REGISTERED" MEANS

1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
3 Proof test of complete sling to twice the working load limit
4 Actual field service test of each design
5 Metal identification ring on each sling
6 Signed Registry Certificate with each sling

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, *New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

*Indicates Warehouse Stocks

ACCO
TRADE MARK

To help you cut production costs . . .

NEW General Electric

D-c Power Source

KINAMATIC* — — — a new standard in direct-current generators and motor-generator sets—designed to give you higher output at less cost.

As a progressive manufacturer, you are faced with the problem of boosting factory output and beating rising production costs. Where your production process involves adjustable speed, tough duty cycles, frequent reversals or speed matching, you may have already applied the performance advantages of d-c drives. To help you further boost production and reduce your automation costs, completely new sources of constant and adjustable-voltage d-c power are now available—General Electric d-c Kinamatic generators and m-g sets, ¾–100 KW.

More Power Per Dollar—D-c Kinamatic generators pack more power per frame size than any previously designed G-E generator. Nine new kilowatt ratings more closely match both the power requirements of your standard d-c drive motors and the power output of standard prime-moving a-c motors. This new matching gives you a more efficient, more compact adjustable-voltage drive at lower cost.

And a Lot More—A d-c Kinamatic generator or motor-generator set can give you much more than savings on initial automation costs. If you would like to know more about the construction details, advanced performance characteristics and money-saving maintenance features of d-c Kinamatic generators and m-g sets, we would like to have a G-E Apparatus Sales Representative call on you. Or, if you prefer, we will send you copies of GEA-6461 and GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-2

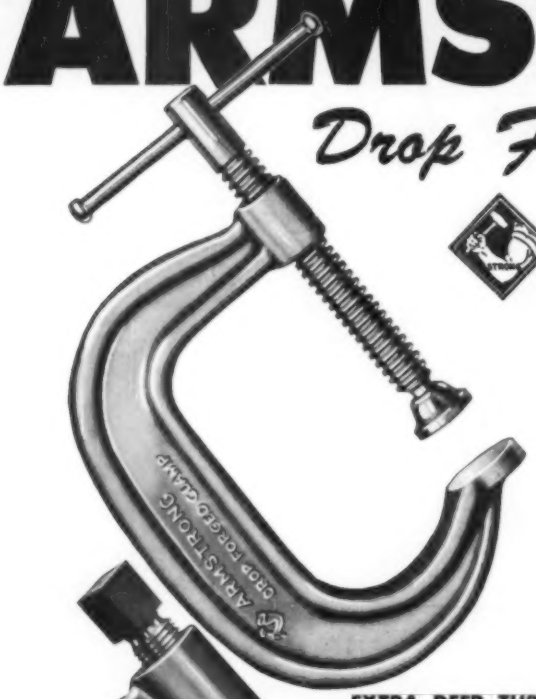
* Trade mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

ARMSTRONG

Drop Forged CLAMPS



LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

EXTRA DEEP THROAT "C" CLAMPS

Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with ground seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(11 sizes to 12" opening)

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

ARMSTRONG BROS. TOOL CO.
5215 W. ARMSTRONG AVE. • CHICAGO 30, U.S.A.

HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Alloy steel screws are hardened at point to prevent upsetting. Ground seat.
(8 sizes to 12" opening)

MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

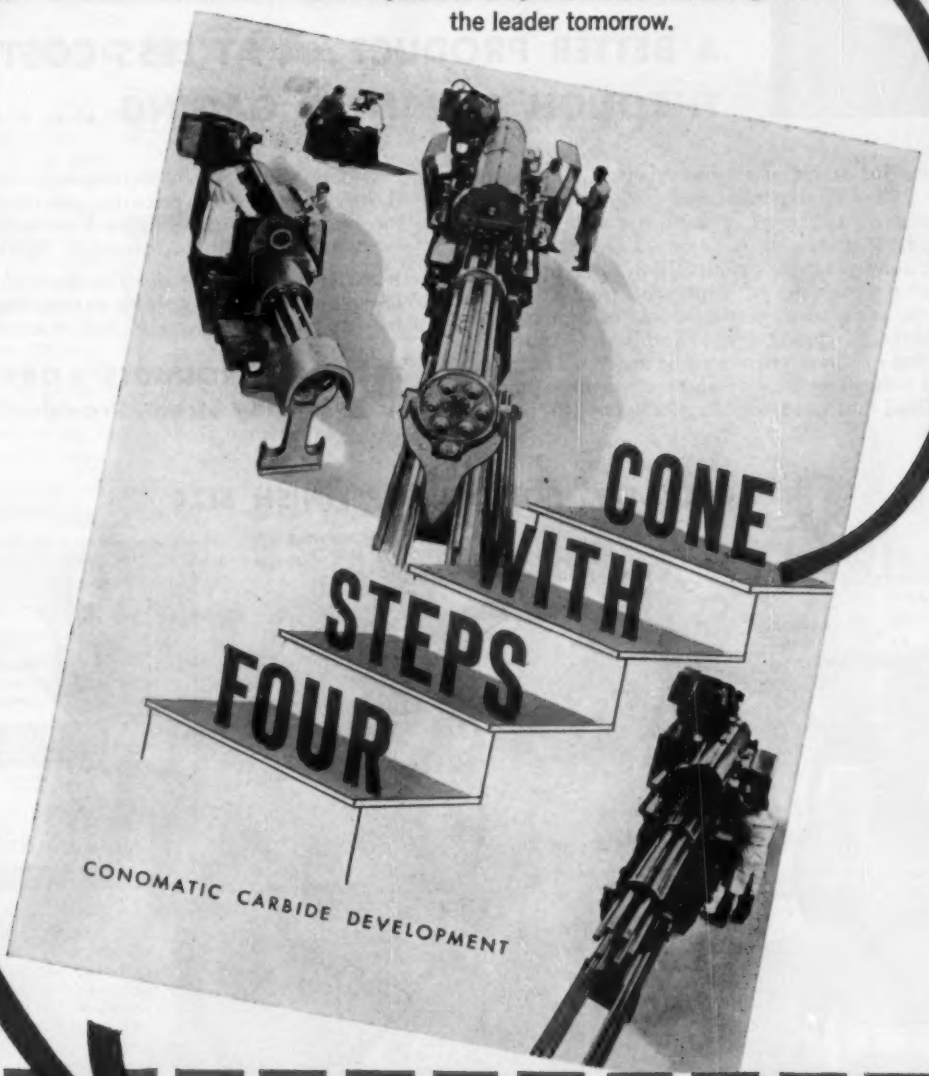
MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

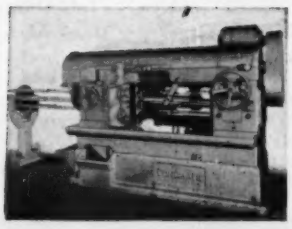
PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.



Write for your free copy of this important booklet today!



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

3 WAYS YOU CAN KEEP

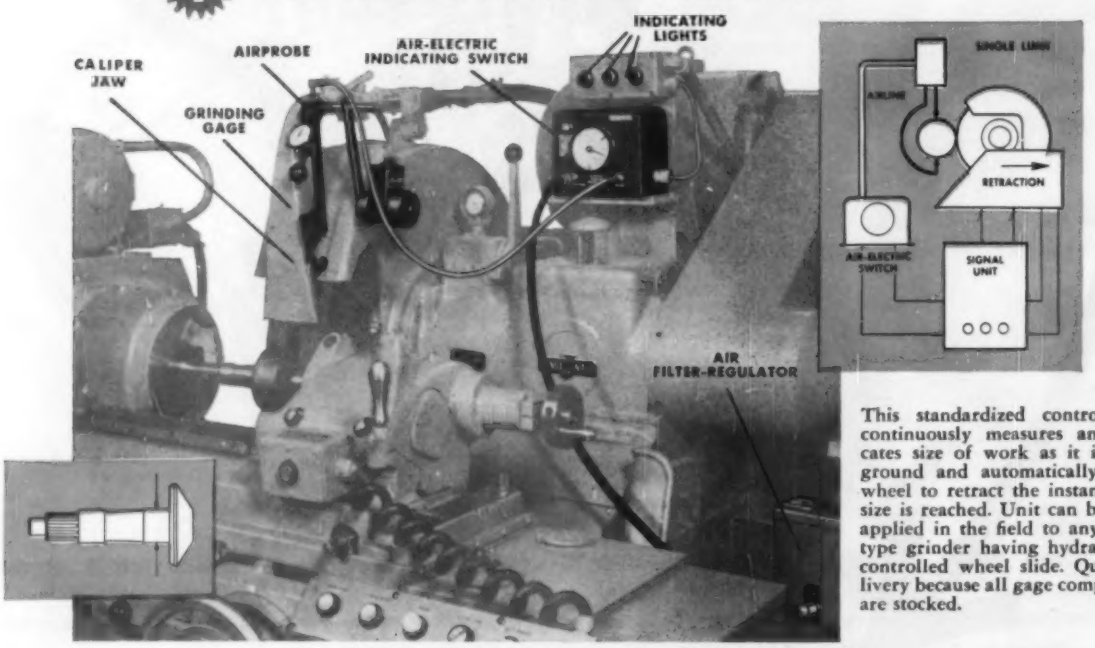
A BETTER PRODUCT . . . AT LESS COST . . . THROUGH ADVANCED GAGING . . . . . .

Profit margins aren't getting any better . . . just the opposite. With buying appetites fairly well satisfied, it's no longer a matter of "getting the stuff out". The problem now is making it *better at lower cost.* You certainly don't plan to let competition catch up to you. So consider these ways of improving product quality and, at the same time, cutting down on the cost per piece. Advanced gaging — by FEDERAL — can do it. The gaging ideas are proven profit makers. The gages, far from being monsters of automation, are compact, standardized units, realistically designed to provide automatic control or inspection, or both, where it does the most good and at a price that practically *every* manufacturer can afford. And they have reliability . . . the most important single feature of FEDERAL Gaging.

Whether you're big or small in terms of production, ***at least one of these gaging arrangements can pay off for you.*** *It's the truth. Ask us to prove it. Write:*

FEDERAL PRODUCTS CORPORATION
7126 Eddy Street, Providence 1, R. I.

1 AUTOMATIC CONTROL OF FINISH SIZE



This standardized control gage continuously measures and indicates size of work as it is being ground and automatically causes wheel to retract the instant finish size is reached. Unit can be easily applied in the field to any center type grinder having hydraulically controlled wheel slide. Quick delivery because all gage components are stocked.

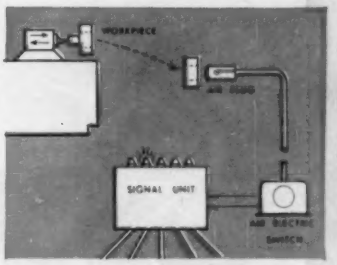
BENEFITS: *Reduces cost of operation — permits one operator to handle two, possibly three grinders performing the same or different operations. In this way gages pay for themselves within a few months.*

Improves quality — even if you have only one grinder, gage is a profit-maker because it eliminates error due to operator inattention or fatigue and also eliminates cost of later inspection. Gage never tires, is accurate to .0001" or better, is easily adjustable to control different sizes of work. Its Air-Electric system overlooks minor workpiece surface irregularities which confuse size readings of other gages.

VARIATIONS: *Similar FEDERAL Gages are available through machine tool manufacturers to also change wheel feed rate to dwell grind . . . or to control dressing cycle and finish size on I.D. grinders. When specifying machine tool requirements be sure to include* FEDERAL *Gaging.* FEDERAL *maintains close engineering alliance with all leading machine tool manufacturers.*

AHEAD OF COMPETITION

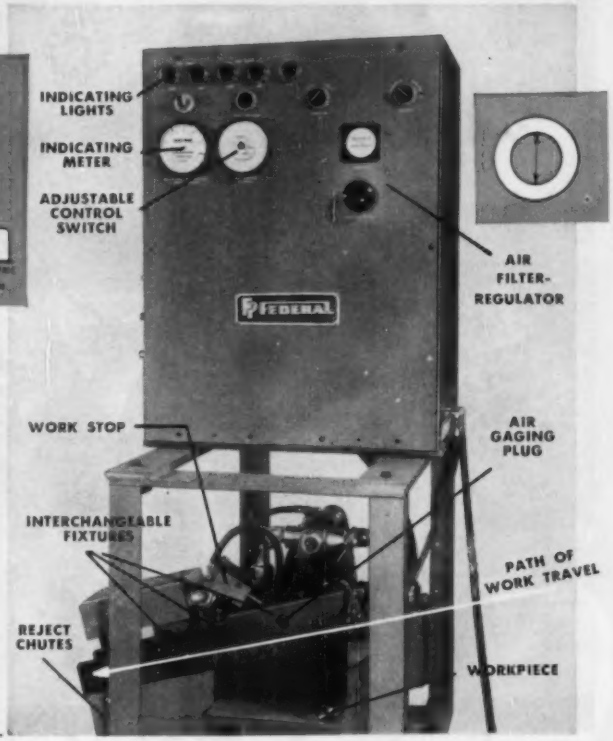
2 AUTOMATIC 100% INSPECTION



This standardized "post-process" gage inspects every part as it is discharged from the machine and sorts work into "good", "near-over", "near-under" plus "salvage" and "scrap", indicating the size of each piece as it is gaged. Operator, watching large indicating lights, can compensate machine for drift and piece-to-piece variation *before any scrap parts are produced.* Unit can be applied to any type I.D. or O.D. grinder, lathe, boring machine or screw machine. Gaging fixtures can be made interchangeable to handle various work sizes.

BENEFITS: *Lower cost per part. Gage virtually eliminates scrap by showing trend before tolerance limits are reached. Eliminates inspection errors — gage has 99.8% reliability or better as compared to about 92% for operator inspection and about 85% for inspection by other personnel.*

VARIATIONS: FEDERAL *Gages of similar type are available through machine tool manufacturers to also provide automatic compensation of the machine, either proportionally or by increments, so that drift is corrected without need for operator attention. Moral: To get the maximum return for your investment, be sure to specify* FEDERAL *Gaging when you're buying machine tools.*



3 SEMI-AUTOMATIC, MULTIPLE DIMENSION MEASUREMENT

Ideal for small and medium production manufacturers, this gage checks nine dimensions in two stations and is adjustable for 64 different sizes! Work is loaded and disposed of manually. Lights show "good", "over" and "under". Units like this one have paid for themselves in well under six months.

BENEFITS: *Reduces non-productive costs — inspection time per part, in a typical case, is reduced 75%.*

Improves quality level. Inspection error is eliminated. Greatly reduced time permits profitable 100% inspection instead of sampling.

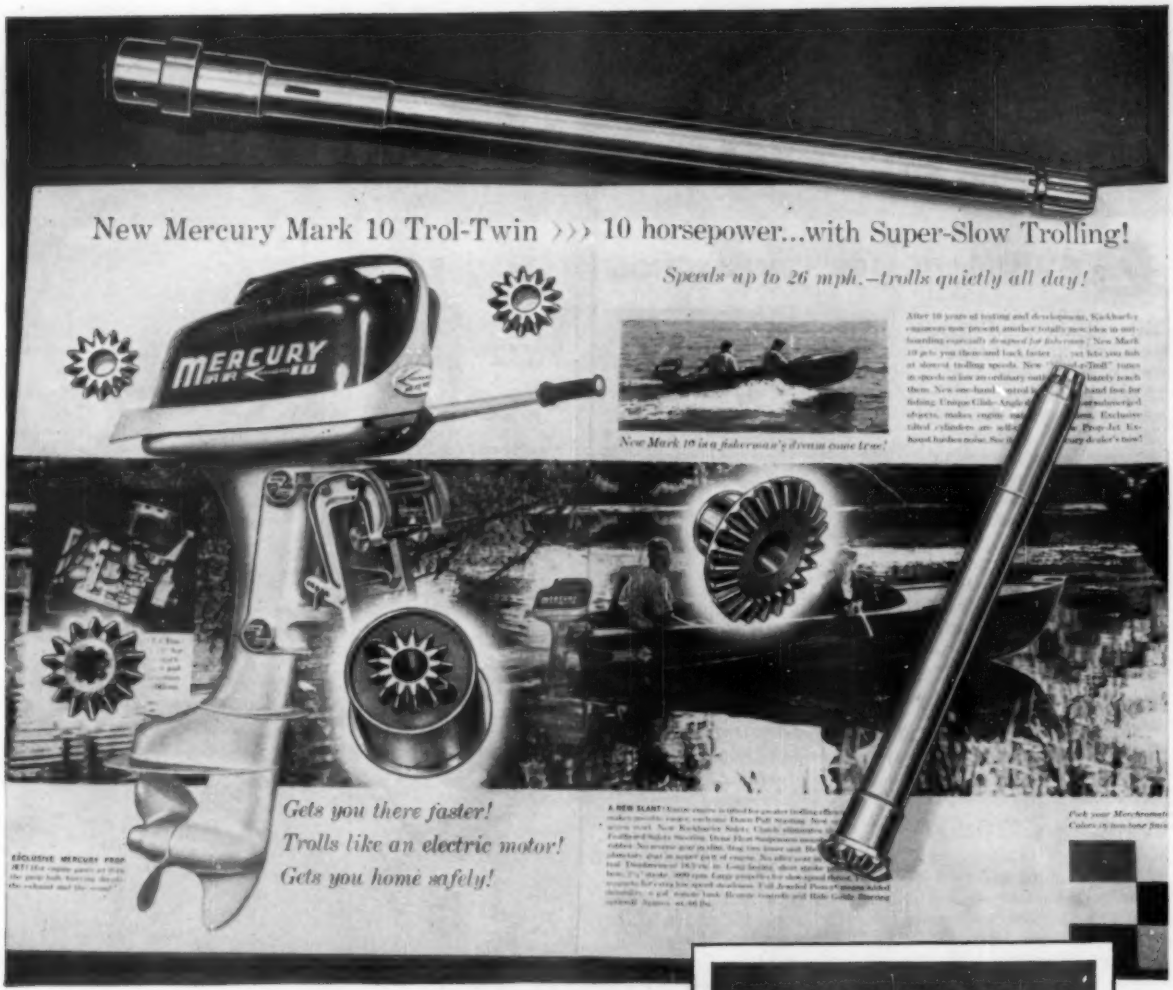
Reduces labor cost. Inspection can be performed satisfactorily by less skilled personnel.

VARIATIONS: *Unit can be designed to provide virtually any combination of dimensional measurements. Sensing elements, electrical components, housing and base are standardized. Other components designed to suit. Unit can incorporate semi-automatic disposal. Number of other design possibilities all the way up to a completely automated inspection and control gage. In every design the emphasis is on reliability. That's why, when you buy* FEDERAL *Gaging, you buy results.*

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging


New Mercury Mark 10 Trol-Twin ››› 10 horsepower...with Super-Slow Trolling!
Speeds up to 26 mph.—trolls quietly all day!
MERCURY
MARK 10
New Mark 10 is a fisherman's dream come true!
Gets you there faster!
Trolls like an electric motor!
Gets you home safely!

The First Automatic Outboard Transmission Features G. S. Small Gearing

The rugged new MERCURY Mark 10 Outboard, with Gearing by G. S., offers *the first automatic transmission in the industry!* The unique transmission engineering development permits one-hand control of throttle, neutral, forward and reverse with the twist-grip on the tiller handle. ★ You, too, can depend upon G. S. for TOP performance in the Gearing you need. Skilled G. S. engineers will gladly lend you valuable aid in determining the ONE best, and most economical application. Send drawings and descriptions today.

SEND FOR.. 6-page Small Gearing Guide. It describes 80 types and applications. Contains useful charts . . a valuable aid to anyone interested in Small Gearing. Use company letterhead, please. No obligation, of course. Write today!

GEAR
Specialties, Inc.
2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

FRACTIONAL HORSEPOWER GEARING

41 Years of Specializing in Small Gearing!

100%

BUTTERFIELD

Special Purpose Taps

Ideal performers in metals like stainless steel, cast iron, brass, aluminum, magnesium . . . with different cutting angles and surface treatments . . . at standard prices from stock.

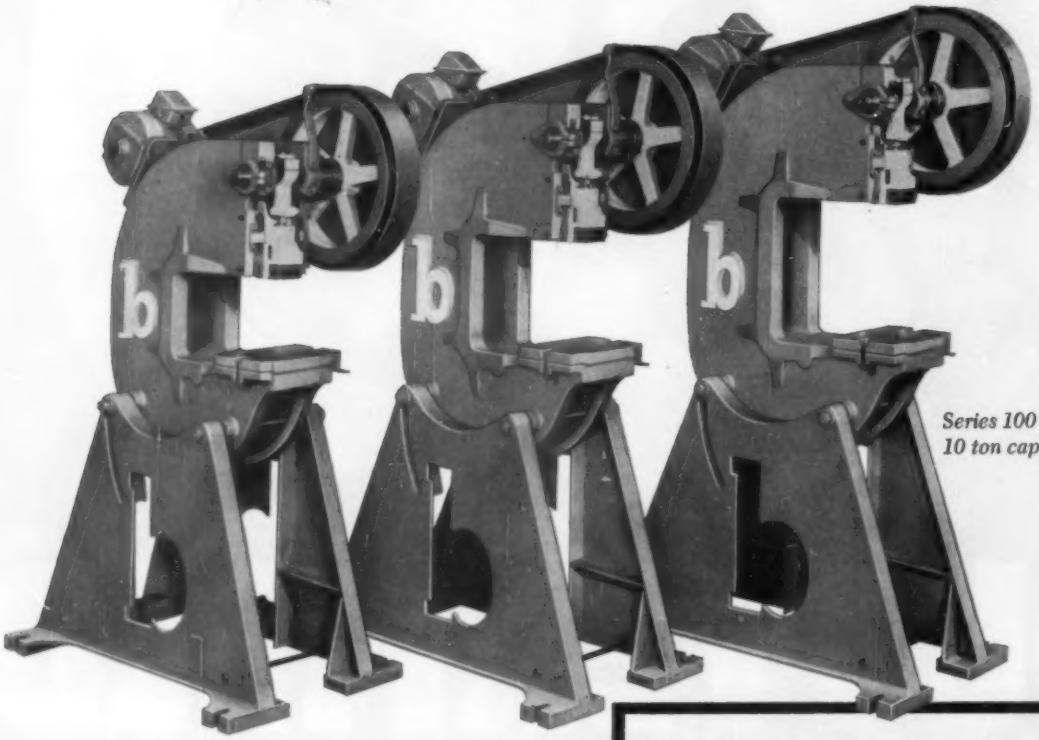
100% COMPLETE LINE . . . EVERY TOOL 100% INSPECTED . . . AND YOU GET

100% SERVICE FROM YOUR BUTTERFIELD DISTRIBUTOR

Butterfield also offers a complete line of taps, dies, drills, reamers, cutters, end mills, hobs and carbide cutting tools. There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. **BUTTERFIELD DIVISION** • Union Twist Drill Company • Derby Line, Vermont.

3 NEW HEAVYWEIGHT CHAMPS

in benchmaster's growing family!



Series 100
10 ton capacity

Here they are... 3 exciting new Deep Throat Benchmasters built with all the pride and craftsmanship of the world's largest manufacturer of small presses and mills! These new models exceed all other Benchmasters in size, weight, work capacity and tonnage! With their sturdy, rigid frames you get all the latest refinements of Benchmaster's long experience in the field... *and remember 60% or more of all small presses sold are Benchmasters!*

For your deep throat requirements, for facilitating large pieces easier, use these new 10-ton Benchmasters... Unmatched for quality, *still* unbeaten for economy!

SPECIFICATIONS

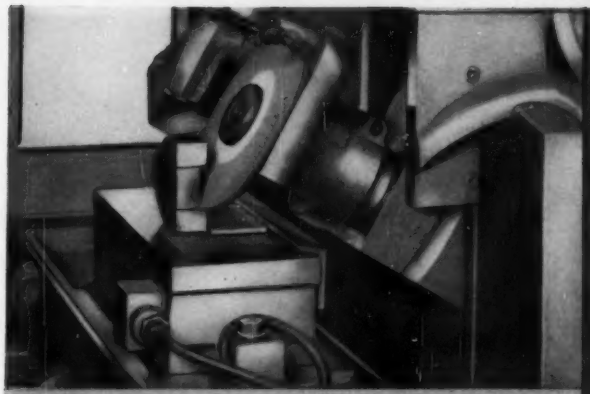
SERIES "100" 10 TON DEEP THROAT PRESSES

	Model "100"	Model "110"	Model "120"
Crankshaft at Main Bearings	1½"	1½"	1½"
Standard Stroke	1¼"	1¼"	1¼"
Shut Height Bed to Slide, Stroke Down, Adj. Up, Std. Stroke	7¾"	10¾"	13¾"
Other Strokes Available	1½"-2" 2½"-3"	1½"-2" 2½"-3"	1½"-2" 2½"-3"
Shut Height for above strokes	7½"-7" 6½"-6"	10½"-10" 9½"-9"	13½"-13" 12½"-12"
Area of Bed front to back and left to right	8" x 11"	8" x 11"	8" x 11"
Bolster Plate Thickness	1"	1"	1"
Adjustment of Slide	1½"	1½"	1½"
Hole in Slide for Punch Shank	1⅜"	1⅜"	1⅜"
Center of Slide to Frame	12"	12"	12"
Flywheel Diameter and Face	18" x 3½"	18" x 3½"	18" x 3½"
Flywheel Weight (Approx.)	125#	125#	125#
Strokes per Minute	180-190	180-190	180-190
Motor H.P. and Speed	¾ HP 1140 RPM	¾ HP 1140 RPM	¾ HP 1140 RPM
Distance from Floor to Bed (Floor Models)	32½"	32½"	32½"
Distance from Bed to Center of Shaft	19¼"	22¼"	25¼"
Floor. Space FB × RL	20" x 35¼"	20" x 35¼"	20" x 35¼"
Overall Height	62¼"	65¼"	68¼"
Size Opening through Back	5"	5"	5"
Shipping Weight Less Motor (Approx.)	940#	975#	1010#

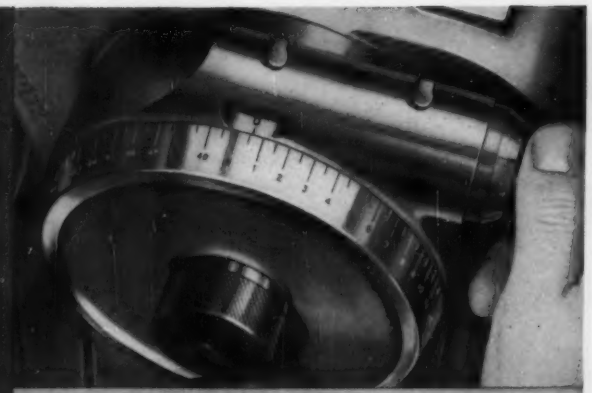
benchmaster

World's largest manufacturer of small punch presses and mills.

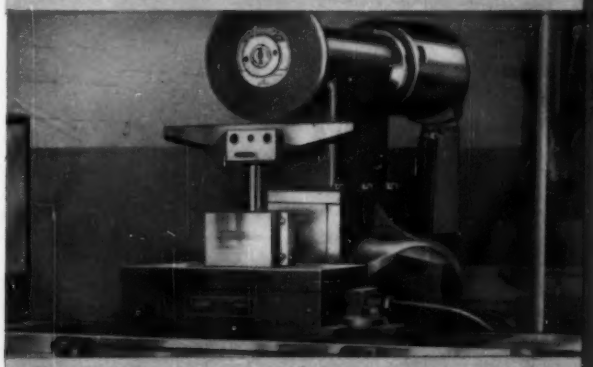
1835 West Rosecrans, Gardena, California



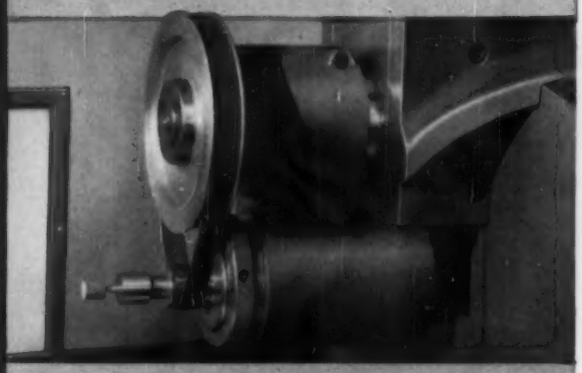
Spindle Tilting Attachment for Tilting Wheelhead allows precision setting of spindle block through an angle of approximately 30°. Exclusive Taft-Peirce angular surface grinding cuts set-up and grinding time in half! Just set workpiece on magnetic chuck, dress wheel and grind. No problem with burrs, working over-size, curved surfacing, or wheel glazing. Big savings in cost and quality control.



Vernier Fine-Feed permits extremely fine grinding fast and accurately. Unique T-P "Spark Test" shows how the No. 1 can repeat to .00005" . . . with surfaces so smooth, in many cases, they seal without lapping. Fine-feed, graduated in .0001" increments spaced ½" apart, is available for either the horizontal or vertical feed.

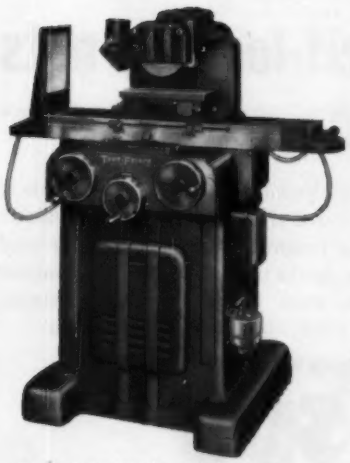


Riser Block provides an extra 12" clearance under the wheel. Block replaces column cap, provides a bore for the spindle quill and permits grinding work up to 24" in height.



High Speed Grinding attachment proves extremely useful for the grinding of angles or slots too small for standard wheels. Ball bearing spindle clamps to main spindle quill, operates at 18,000 rpm.

Extra Features make the "No. 1" your Most Profitable precision tool



This is the Taft-Peirce No. 1 Grinder

No need to go looking (or try and "make do") when you want extreme precision or extra flexibility on a surface grinding job. It's all yours in the Taft-Peirce No. 1. For tool room or production line, this precision surface grinder gives you the key three for profits: Output, quality and economy.

Shown here are just four of the some seventeen attachments and accessory equipments available to you with the T-P No. 1 Grinder.

See for yourself! Each of these features means extra savings — see them demonstrated and judge for yourself. Contact your local T-P representative or write: Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island.

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

Vibration won't loosen FLEXLOC self-locking nuts

Where products must be reliable . . . must stand up under vibration, temperature extremes and hard use . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting locking action. And they are reusable: repeated removal and replacement, frequent adjustments, even rough screw threads will not affect their locking life.

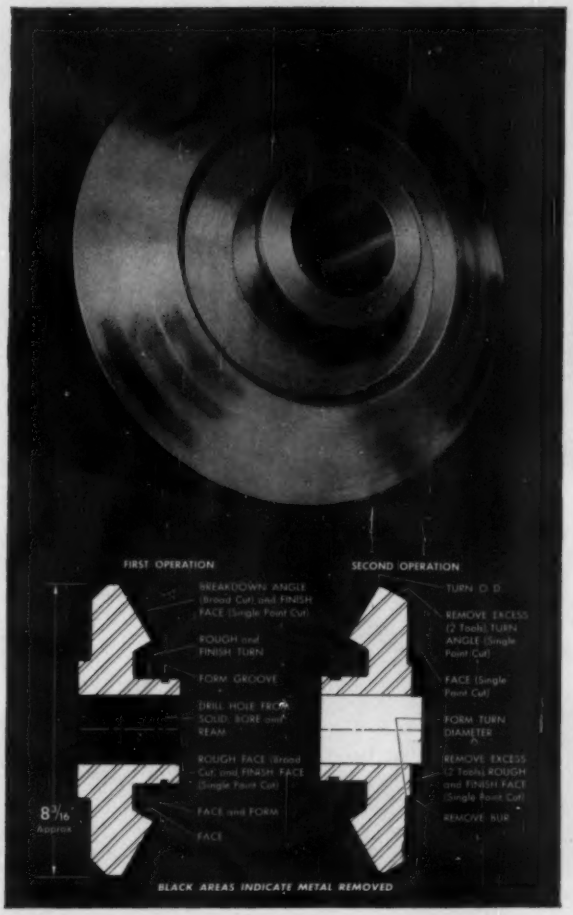
Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes, types and materials to meet the most critical locknut requirements. Your local industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 1 , Pa.

FLEXLOC® LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA


FIRST OPERATION
SECOND OPERATION
BREAKDOWN ANGLE (Broad Cut) and FINISH FACE (Single Point Cut)
ROUGH and FINISH TURN
FORM GROOVE
DRILL HOLE FROM SOLID, BORE and REAM
ROUGH FACE (Broad Cut) and FINISH FACE (Single Point Cut)
FACE and FORM
FACE
TURN O. D.
REMOVE EXCESS (2 Tools) TURN ANGLE (Single Point Cut)
FACE (Single Point Cut)
FORM TURN DIAMETER
REMOVE EXCESS (2 Tools) ROUGH and FINISH FACE (Single Point Cut)
REMOVE BUR
8 3/16 Approx
BLACK AREAS INDICATE METAL REMOVED

Let me show you how one of our P & J Automatics

put this

"PROBLEM" Job on a PAYING BASIS!

Some of the toughest machining jobs you'll ever have to handle get that way, *not* because of any *single* factor like extra-hard metal or really heavy cutting, but because of *several* contributing factors that can add up to a lot of machining time and a big profit loss. The job shown here . . . which one of our customers brought in recently . . . is a good example. A glance at the "Job Facts" will show you a combination of factors that could easily have made this job a real problem. The most difficult of these requirements was machining the bevels . . . which had to meet close tolerances for size and conformity to the true angle and, in addition, demanded a fine finish with *no* tool-return marks permitted. However, handling this part on a Potter & Johnston 4-U Automatic, with a tooling set-up engineered by P&J Tooling Specialists, put this potential headache on a high-output, high-profit basis.

HERE ARE THE JOB FACTS:

PART: *Bevel Gear*

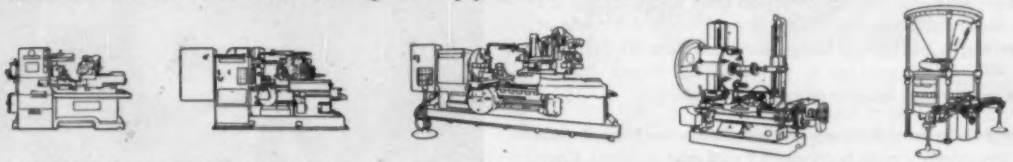
MATERIAL: *Steel Forging, 190 Brinell*

MACHINING REQUIRED: *22 separate roughing and finishing cuts including several hard-to-handle angle cuts.*

SPECIAL REQUIREMENTS: *Hold bevel angles to close tolerances and produce a good finish.*

RESULTS: *A part finished every 13 minutes floor-to-floor time . . . on a P&J 4-U Automatic!*

A new P&J Automatic can put *your* problem jobs on a paying basis too! Send me your sample prints and I'll show you how a P&J Automatic with P&J Tooling can help you turn out your toughest jobs faster, better and at lower cost. Write Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . GILDA PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

Resistance welding machine is operated by a two-button start-stop station and two heavy-duty stations with mushroom-head buttons.

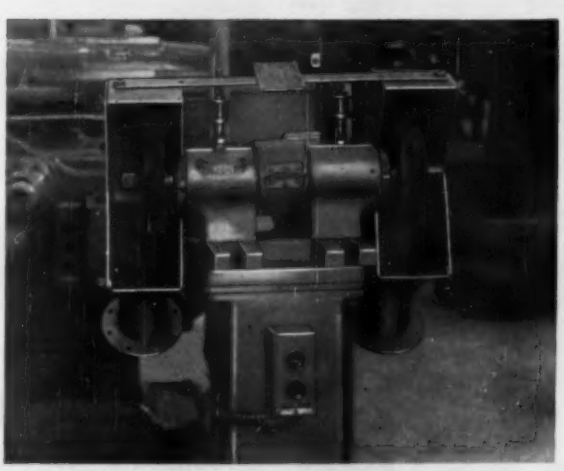
Two ways General Electric pushbuttons save you valuable production time

FAST DELIVERY. You can save valuable production time by using General Electric standard- or heavy-duty pushbuttons because G-E distributors keep a complete stock of these stations. You can get the forms you want, when you want, simply by calling your General Electric distributor.

DEPENDABLE OPERATION. Once installed, General Electric pushbuttons save you more production time because they are built for dependable service. Durable enclosures are made of steel for strength and safety. Large silver contacts are designed for long life. Good contact is provided by strong button springs which reduce chance of contact freezing.

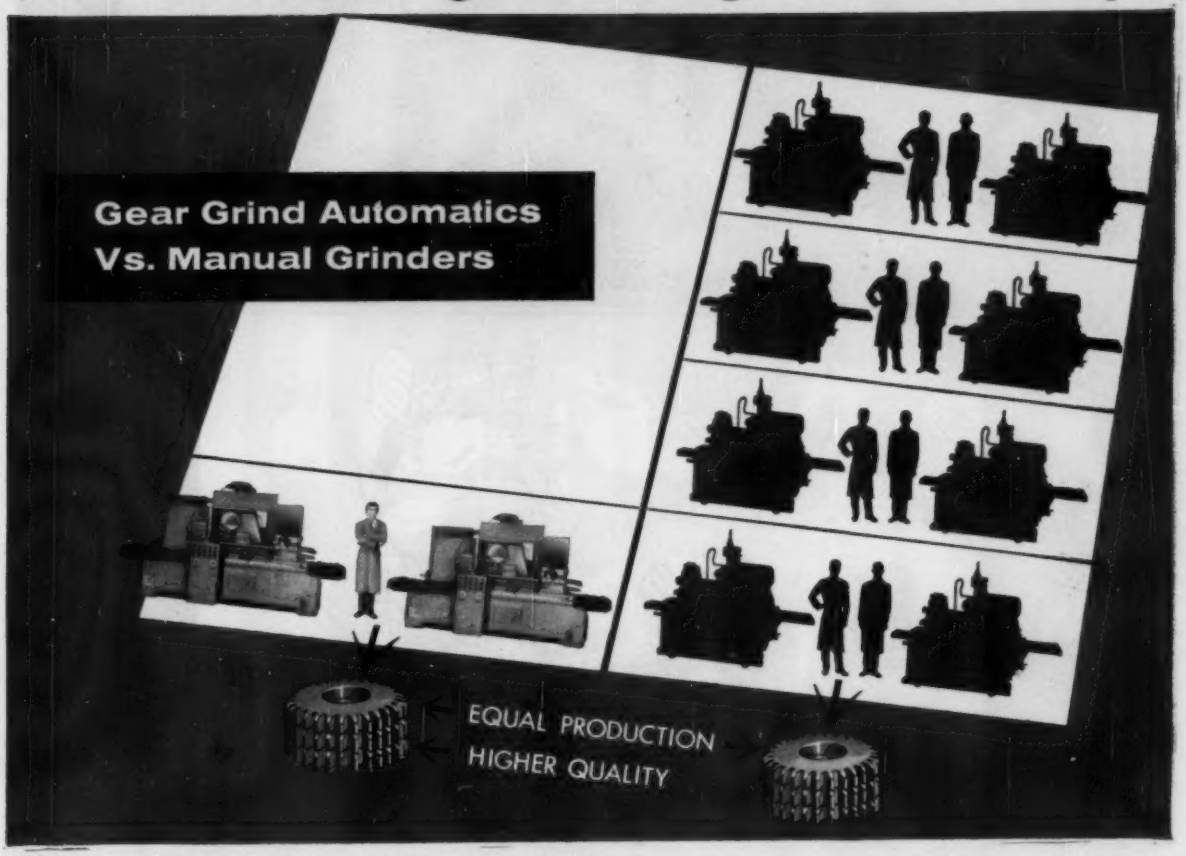
Standard-duty pushbuttons are available in 1 to 3 unit stations, heavy-duty push buttons in 1 to 6 unit stations. Contact your nearest G-E distributor for more information, or write advertising Section 733–29, General Electric Co., Bloomington, Ill. Ask for bulletin GEA-6544, "Standard- and Heavy-duty Pushbuttons."

GENERAL ELECTRIC



General Electric standard-duty pushbutton station provides economical and dependable start-stop operation as on the grinder above.

Here's real grinding economy!



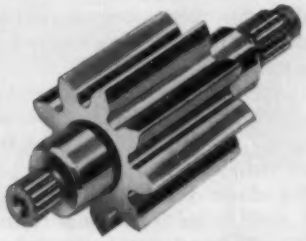
2 Automatics with 1 Operator Equals 8 Manuals with 8 Skilled Operators

¼ the floor space
¼ the number of machines
⅛ the manpower
} Gear Grinding Economy

GEAR GRIND Detroit

PUMP ROTORS
600 pcs./8 hrs./machine

PUMP GEAR



floor to floor grinding cycle—minutes for 7 tooth; 12 minutes for 11 tooth

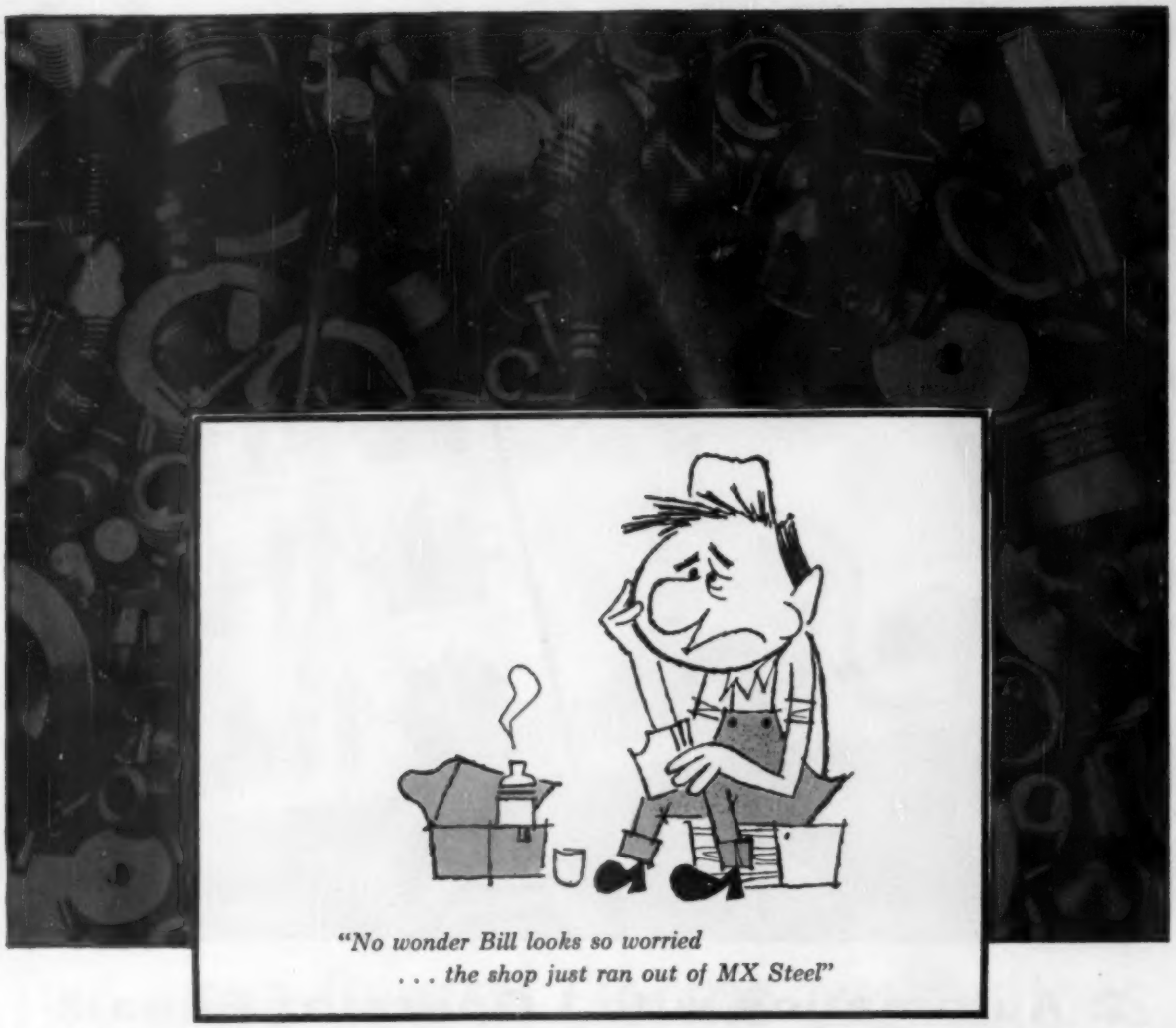
For all the facts—write today!

THE GEAR GRINDING MACHINE COMPANY

3919 Christopher, Detroit 11, Michigan

Contract Grinding Service

COMPLETE RANGE OF GEAR & SPLINE GRINDERS
EXTERNAL **INTERNAL**



"No wonder Bill looks so worried
. . . the shop just ran out of MX Steel"

Smart shops, once they have put USS MX Free-Machining Steel to work, take good care *not* to run out of this faster-cutting screw stock.

For MX Brand, although it costs no more than ordinary screw stock grades, gives them money-saving advantages that they can't afford to pass up.

By increasing the rate of production, *MX Steel lowers the cost per part.* By prolonging tool life, *MX Steel reduces down time.* By providing closer dimensional accuracy, *MX Steel helps to minimize rejects.*

These highly desirable results have been consistently obtained in the production of literally billions of parts—of many different kinds and under widely different conditions. That's why we feel confident that USS MX Steel will cut the cost of any part you now machine from ordinary screw stock.

Remember that USS MX Free-Machining Steel has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today.

USS MX Free-Machining Steel is available in both Bessemer and Open Hearth grades and in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, under either the trademark "MX" or his own identifying trade name. In hot-rolled form, MX Steel is available from our district sales offices.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION,
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Lower costs . . . bigger output . . . longer tool life

USS *—when you do the job with free-machining*

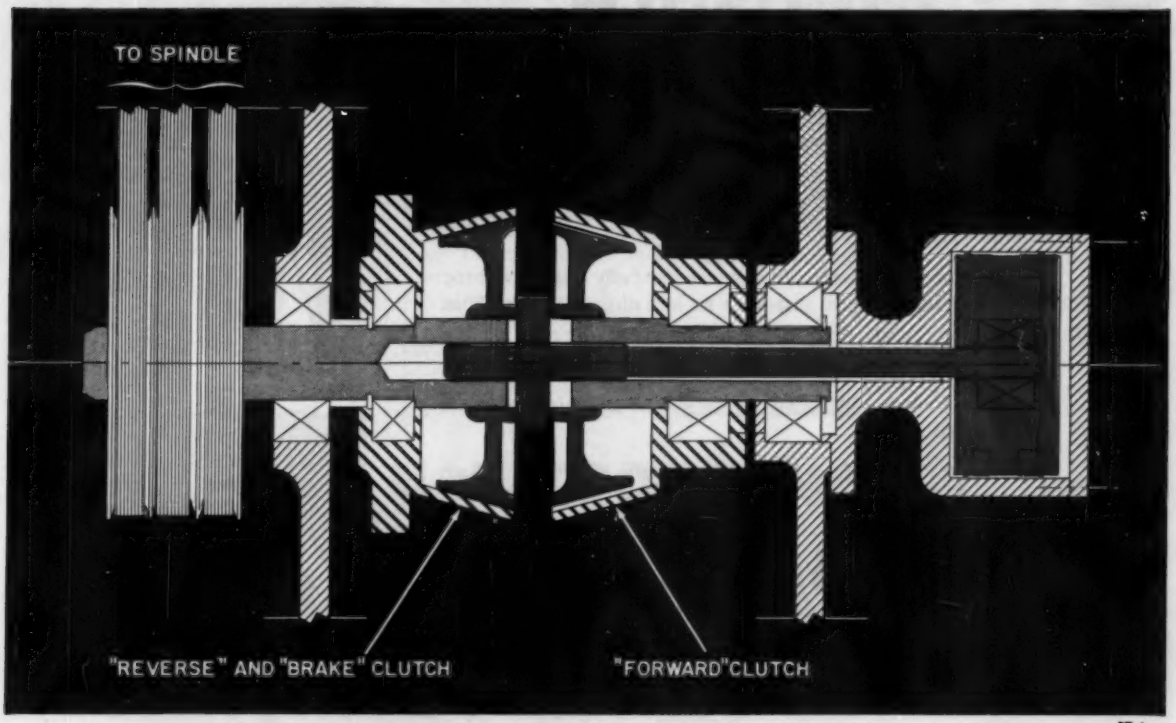
MX

Registered trademark

UNITED STATES STEEL

AVAILABLE FOR ANY SCREWMATIC 750:

NOW: A Spindle Reversing Clutch That Never Needs Adjustment! Requires No Warm-Up Period!



57-4

Can you think of *any* other screw machine that offers these important cost saving features . . . ?

ACCURACY: Reversing point repeats within ¼ spindle revolution. Even taper pipe threading becomes an ordinary operation with the new Screwmatic 750.

RELIABILITY: Wear will not affect clutch tension or reversing point accuracy.

SIMPLICITY: Constant air pressure of piston acts directly on clutch. No adjusting is ever required.

RUGGEDNESS: Roughly 1000 pounds pressure is applied to clutch cones to insure positive spindle drive.

VERSATILITY: Select most efficient time cycle—spindle will reverse at same point regardless of time cycle gears selected—no high-to-low speed ratio limitations.

ECONOMY: In many cases this new Screwmatic reversing spindle has eliminated the need for left-hand tooling entirely.

AN IMPORTANT NOTE TO PRESENT OWNERS OF A DETROIT SCREWMATIC 750: Because of the 750's exclusive unit construction design which allows piecemeal replacement of entire assemblies, the new Screwmatic spindle reversing clutch described here can be easily and economically installed on *any* Screwmatic 750.

SEND FOR MORE INFORMATION: on how the unique Detroit Screwmatic 750 can cut your production costs—send for your free copy of the new 16-page Screwmatic 750 catalog.

THE GEAR GRINDING MACHINE CO.

3919 Christopher • Detroit 11, Michigan

MANUFACTURERS OF:
FULLY AUTOMATIC GEAR GRINDING MACHINES
RZEPPA ("SHEPPA") CONSTANT VELOCITY UNIVERSAL JOINTS

*Controlled Measure

There's something majestic about a bridge. We often view it in its entirety . . . without appreciating the many components that contribute toward its strength as a unit.

Yet — even in such a huge structure . . . controlled measure is important.

Precision and balance of parts are carefully engineered for stress and strain. Each part must fit in ratio, as accurately as the intricate pieces of a delicate instrument.

Bath cylindrical plug or thread, ring or reversible type gages, guarantee controlled measure of component parts on the inspection line.

Made for dependable service and long wear-life . . . Bath gages are your best buy for reliable check of threaded and plain parts.

JOHN BATH & CO. Inc.
22 Grafton St., Worcester, Mass.
CYLINDRICAL AND THREAD GAGES • GROUND THREAD TAPS
INTERNAL MICROMETERS

*When you buy Bath Gages . . .
you buy controlled measure!*

The formed metal stamping illustrated above is produced complete on the U. S. No. 33 Multi-Slide Machine shown below.

ON FORMED STAMPINGS REDUCE COSTS WITH U. S. MULTI-SLIDES®

If you produce formed metal stampings, the U. S. Multi-Slide may be the answer to your cost reduction problems. The part illustrated is just one of the many different types of stampings that can be produced complete on the U. S. Multi-Slide — without secondary handlings . . . and every such operation that can be eliminated increases your profit potential.

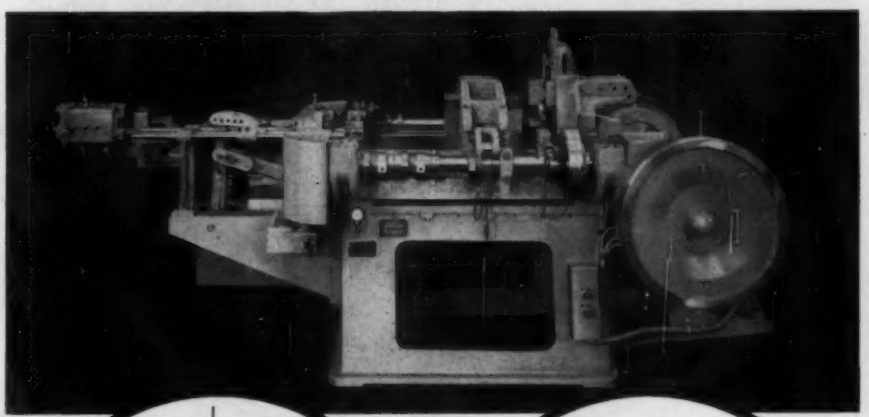
The combination of ram action, four-slide forming, vertical stripper and various auxiliary units allows for the designing of tools to produce intricate parts complete — without secondary operations. Since these movements are an integral part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves, thereby giving the added advantage of reduced tool maintenance cost.

Investigate! Ask for a copy of Bulletin 15-A, or send us part drawings or samples for our recommendations.

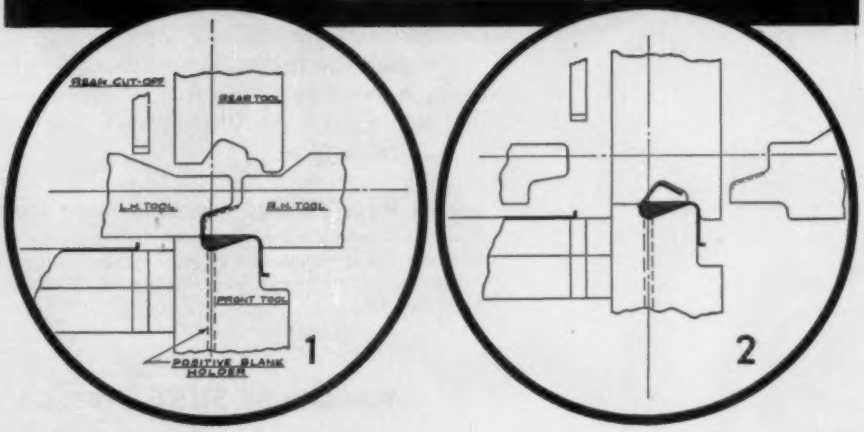
U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

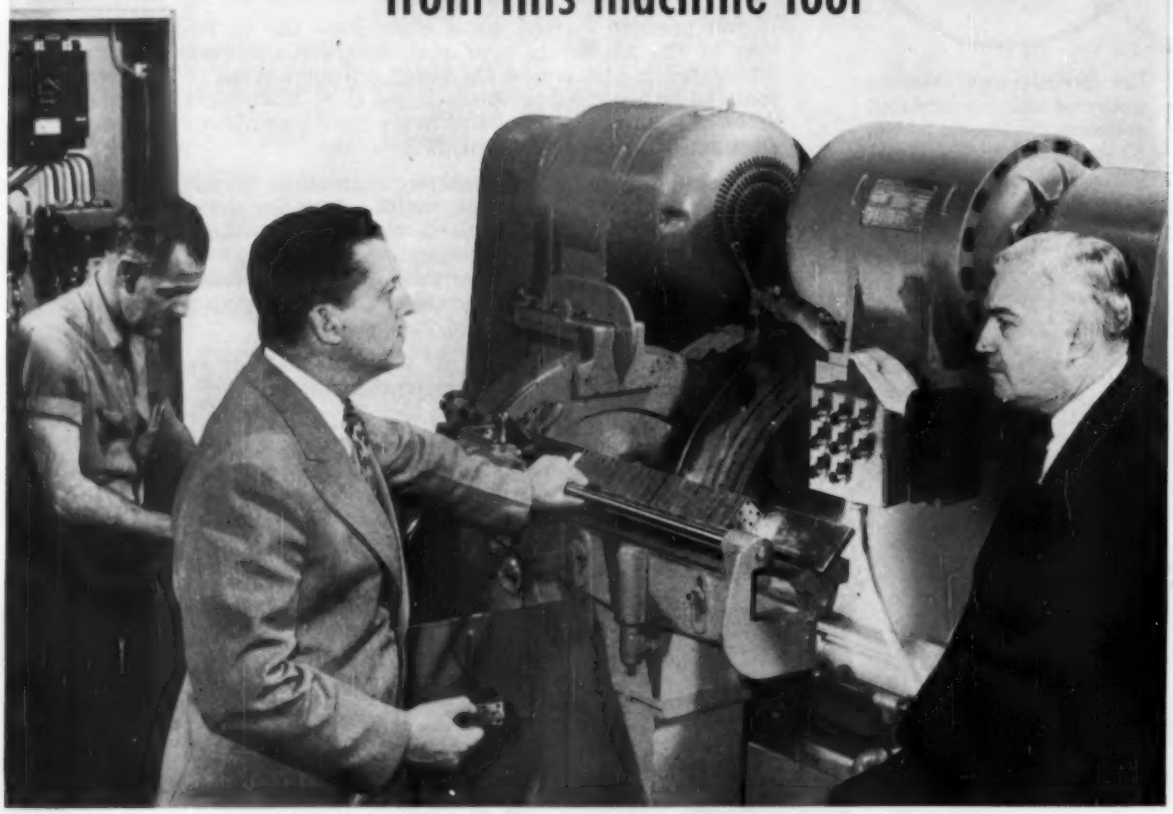


Right: The No. 33 U. S. Multi-Slide with capacity for material up to 2½" wide, with feed length adjustable up to 12½".



Right: Operations in the forming position. 1 — Front, right-hand and left-hand tools entered to preform part around post. 2 — Right-hand and left-hand tools retracted; front and rear tools entered to complete the form.

"We specified Westinghouse components to get more production from this machine tool"



Trends to greater precision and higher operating speeds for machine-tools make components selection a critical decision.

Westinghouse components are built to deliver all the outstanding performance the machine-tool designer intended. Their long, dependable service life assures high machine-tool availability for accelerated, continuous production.

Westinghouse ability to understand, supply and service machine-tool needs is based on 40 years' firsthand experience in serving the machine-tool industry. Choose Westinghouse components to bring out the best in your machine tools. J-96107

Specify these Westinghouse components when you buy machine tools:
Motors • Controls • Pushbuttons • Gearmotors • Speed Reducers • Adjustable-Speed Drives • Semiconductors • Cypak* Static Control • Rectifiers • Magamp* Magnetic Amplifiers • Instruments • Relays • Machine-Tool Transformers • DYNAC® Magnetic Braking.

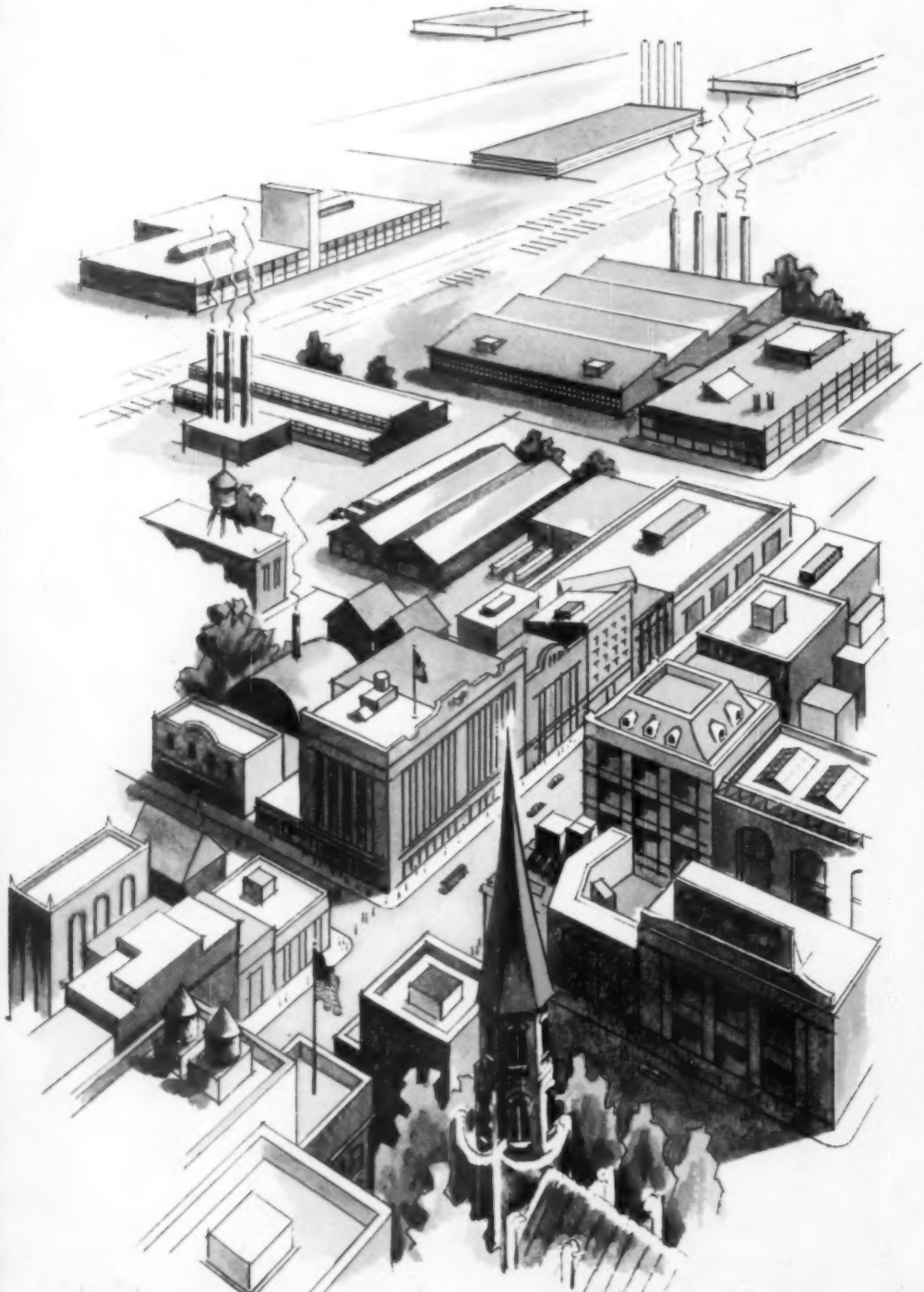
*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

COME WITH US AND
MEET SOME OF THE
IMPORTANT MEMBERS OF
THE PUTNAM FAMILY

YOUR PUTNAM DISTRIBUTOR

Serves Local Industry



We, at Putnam Too
distributor organiza
making for 20 ye
coast-to-coast, it con
men, respected me
make their business

Our distributors . . .
form an invaluable
economic system. Be
establishments we,
have throughout th
rooms and local inv
can be sold and qui

Because of the natu
men of diversity . . .
things. Putnam dist
with many tools and
turing processes. In
salesmen, bookkeep
labor experts, etc.

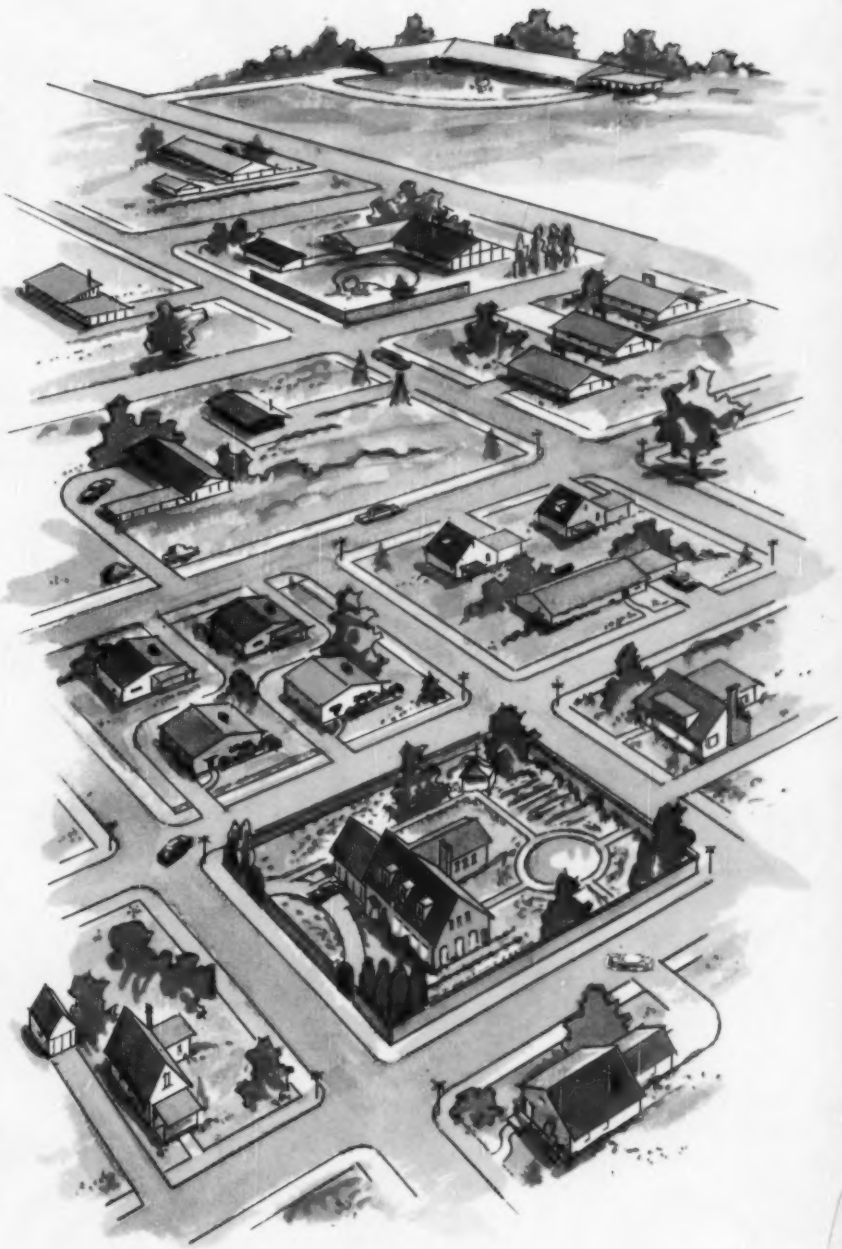
These men and their
gral part of their c
of labor . . . som
In either case they ar
taxes and services
munal wealth.

With their roots dee
these men take an a
distributors are foun
in church and scho
municipal governmen
American . . . solid b

This is why we, at Pu
a privilege to be as
express our thanks f

R . . .

ry and the Community



m Tool Company, are proud of our anization . . . which has been in the 0 years. Strategically located from it consists of carefully chosen business d members of their community who siness a career of service.

s . . . and countless others like them . . . uable link in the chain of America's m. Because of them and their business we, as a manufacturer of end mills, out the country: warehouses, display al inventories from which our products nd quickly delivered to industry.

nature of their business they must be ty . . . have wide knowledge of many distributor personnel are familiar ls and their applications in manufac- es. Into the bargain they must be kkeepers, market analysts, tax and etc.

their places of business are an inte- heir communities. They are employers sometimes large, sometimes small. ey are substantial business men whose rvices contribute materially to com-

s deep in their respective communities an active part in civic affairs. Putnam found on the rosters of service clubs, school activities, and serving with rnments. They are in short: thoroughly olid business men . . . good neighbors.

at Putnam Tool Company, consider it be associated with these men and to anks for the things they do.

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

OVER 1700 STANDARD TYPES AND SIZES OF PUTNAM HI-SPEED END MILLS

For your convenience and quickest delivery, Putnam catalog lists over 1700 standard types and sizes of highest quality . . . faster cutting . . . longer lasting Hi-Speed end mills. These standard end mills are carried in stock at the factory and by Putnam distributors throughout the country. This means . . . there is a Putnam standard for nearly every milling operation . . . you can select a standard end mill from the catalog today and it can be on your job tomorrow . . . simply call your local Putnam distributor.

COMPLETE LINE OF STANDARD END MILLS for ALUMINUM

Standard End Mills . . . For the first time you can select from a complete line of standard end mills designed specifically for milling aluminum . . . Putnam stocks 185 standard types and sizes.

New Designs . . . These standard end mills have been developed through years of research and experience on aluminum applications. Over a year ago, Putnam introduced the first standard end mills designed for milling of aluminum. Today, no other manufacturer offers as complete a line of standard end mills for aluminum.

PUTNAM POSTIV-LOK END MILLS

★ *Eliminate Integral Shanks*

★ *Reduce Change-Over Time*

★ *Assure Positive Locking*

6132 LITHO IN U.S.A.—250 M DO—

PUTNAM

TOOL COMPANY

2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

how to produce less for the scrap heap

capacities to ¼" by 12 feet

your LODGE-ical choice...

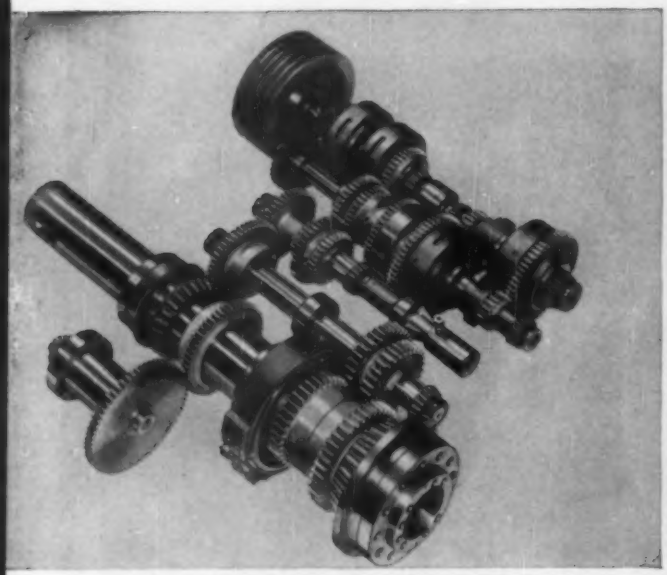
Lodge & Shipley

Check your scrap "production." A certain amount of scrap is to be expected. But, if your scrap heap is growing out of bounds chances are, your shear is a contributor.

Even a skilled operator is at the mercy of a "cranky," inaccurate shear. Put the same operator on a Lodge & Shipley Shear with "built-in" accuracy and watch production flow. Lodge & Shipley Power Squaring Shears are geared for accurate shearing . . . produce for less for the scrap heap and for more for production.

For details, request New Condensed Catalog PS-13. Write The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

WANT MORE POWER, MORE SPEEDS?



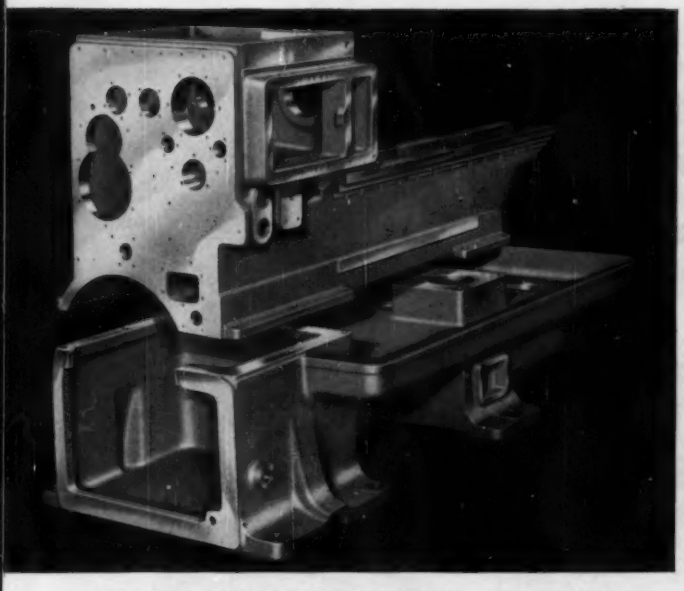
NEW HEADSTOCK GEAR TRAIN—sixteen different spindle speeds available, powered by up to 30 h.p. single-speed driving motor delivering full power at all speeds. Spindle is mounted on selected pre-loaded, precision-tapered roller bearings. Heavier, more rugged design provides smoother, quieter power.

HYDRAULIC SPEED SELECTOR—smooth, effortless speed changes. No waiting, no computing, no stopping of spindle, no releasing of main drive clutch. Operates direct or pre-set. Hi-Lo Lever permits instantaneous speed changes in 8:1 ratio without moving Speed Selector handwheel. Multiple Disc Clutches have automatic take-up for wear.

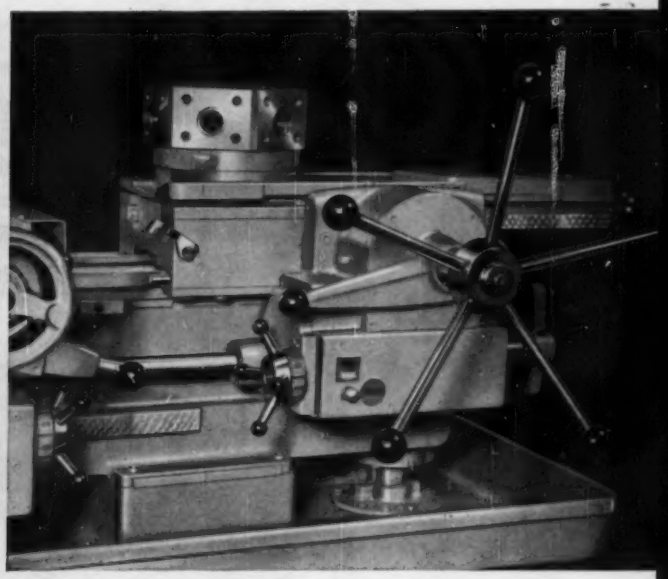
YOU GET THEM ALL...PLUS

NEW GISHOLT MASTERLINE

WANT HEAVY CUTS WITHOUT VIBRATION?



NEW HEADSTOCK AND BED CASTING—scientific design dampens out vibrations, assures smooth operation and simplifies holding closer tolerances. Made from semi-steel, poured in Gisholt's own foundry. Greater swing over ways permits bigger chucks and broader range of workpiece sizes. Provides a solid foundation for all types of work.



NEW TURRET RAM AND SADDLE—designed wider, heavier, more rigid to handle increased capacity and higher speeds. Dial-type feed selector makes feed changes faster, easier. Turret ram rigidly supported on 64-66 Rockwell C alloy steel way strips. Power transmitted through serrated tooth clutches, with shear pin protection against overloading.

GREATER VERSATILITY...WITH THE

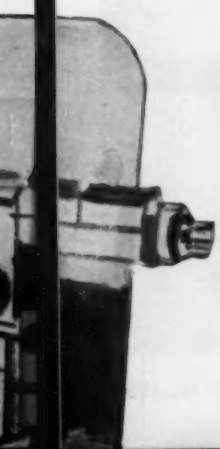
RAM TYPE TURRET LATHE

YOU'LL SPEED UP your production jobs—both large and small—with this more powerful, more versatile Gisholt MASTERLINE Ram Type Turret Lathe.

Here is a machine designed from end-to-end for easier setups, faster change-over and higher productive output than ever before. Check the advanced features illustrated above. Note the reserve power to handle your heaviest cuts—and to meet your tooling requirements of tomorrow. Note the extra spindle speeds—all at your operator's finger tips, without computing—for faster, better turning of any type material. And look over the new massive design, the over-all ruggedness that permits greater accuracy, closer tolerances, deeper cuts at punishing feeds without vibration.

Find out now how this powerful, flexible Gisholt MASTERLINE Ram Type Turret Lathe can reduce floor-to-floor time on your specific jobs. Call your Gisholt Representative today—let him show you how this advanced machine can fit most profitably into your production picture. Or write direct to Gisholt for the new literature described below.

READY NOW—all-new, 18-page illustrated Bulletin No. 1174-B, covering features, accessories, tools and floor plans on new Gisholt MASTERLINE Ram Type Turret Lathes. Ask for it!

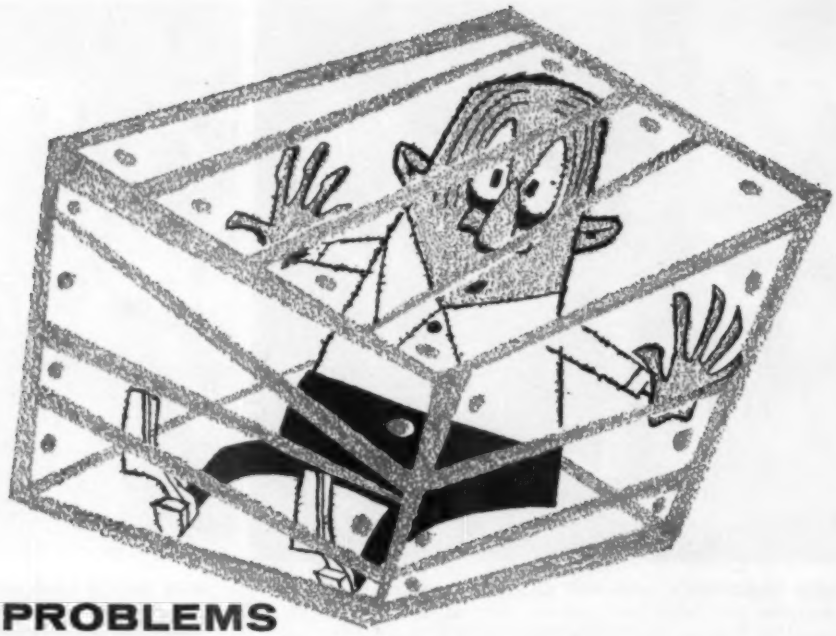


GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS



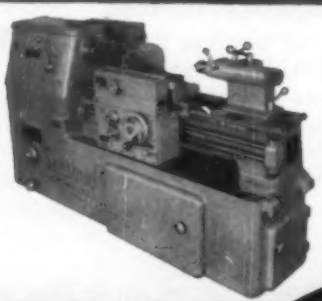
THREADING PROBLEMS HAVE YOU "BOXED IN"?

Pry the lid off *your* threading problems by checking the rugged Cri-Dan.

For the maximum in built-in speed and accuracy enhanced by single-point economy and automatic efficiency, it's the versatile Cri-Dan "B". For heavier jobs, Cri-Dan "E" fits the bill perfectly.

Before you buy *any* threading machine, check Cri-Dan. Get the informative Cri-Dan story from your distributor. Or write Lees-Bradner—no obligation.

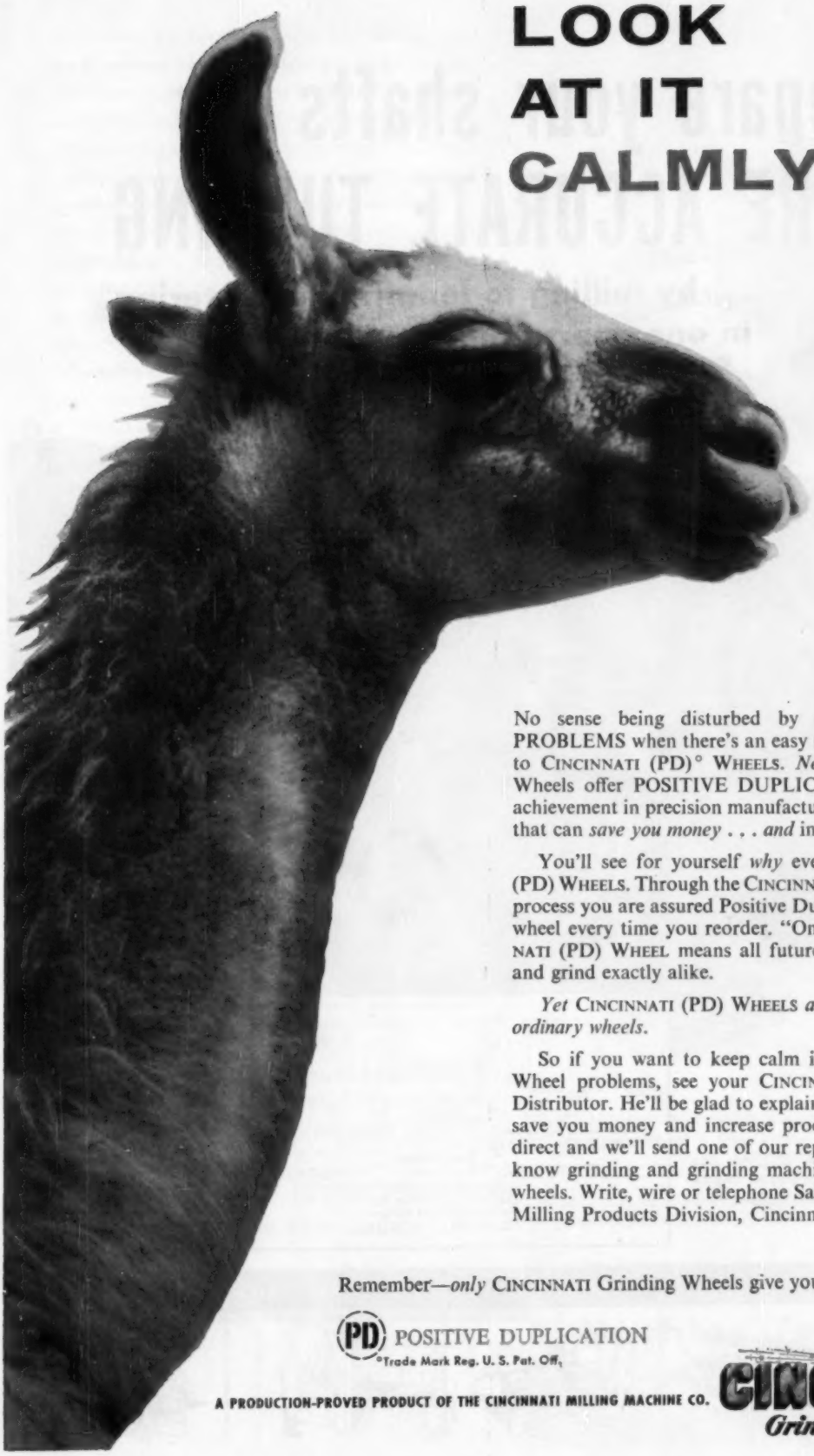
CRI-DAN



SPECIFICATIONS	CRI-DAN "B"	CRI-DAN "E"
Threading Range	6 TPI—48 TPI	2 TPI—48 TPI
Max. Thd. Dia. (Internal)*	6"	16"
Max. Thd. Dia. (External)*	4"	12"
Length Between Centers	36"	2' 6", 5' 6", 8' 6"
Spindle Speeds	145 to 2800 RPM	50 to 1400 RPM

Conditions permitting, these diameters can be extended

CRI-DAN DIVISION
of
Lees-Bradner Co.
CLEVELAND 11, OHIO, U.S.A.



LOOK AT IT CALMLY

No sense being disturbed by GRINDING WHEEL PROBLEMS when there's an easy solution in sight. Switch to CINCINNATI (PD)° WHEELS. *Now* Cincinnati Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can *save you money . . . and* increase your production.

You'll see for yourself *why* everybody's talking about (PD) WHEELS. Through the CINCINNATI (PD) Manufacturing process you are assured Positive Duplication of the original wheel every time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So if you want to keep calm in the face of Grinding Wheel problems, see your CINCINNATI Grinding Wheels Distributor. He'll be glad to explain how (PD) WHEELS can save you money and increase production. Or, contact us direct and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you

(PD) POSITIVE DUPLICATION

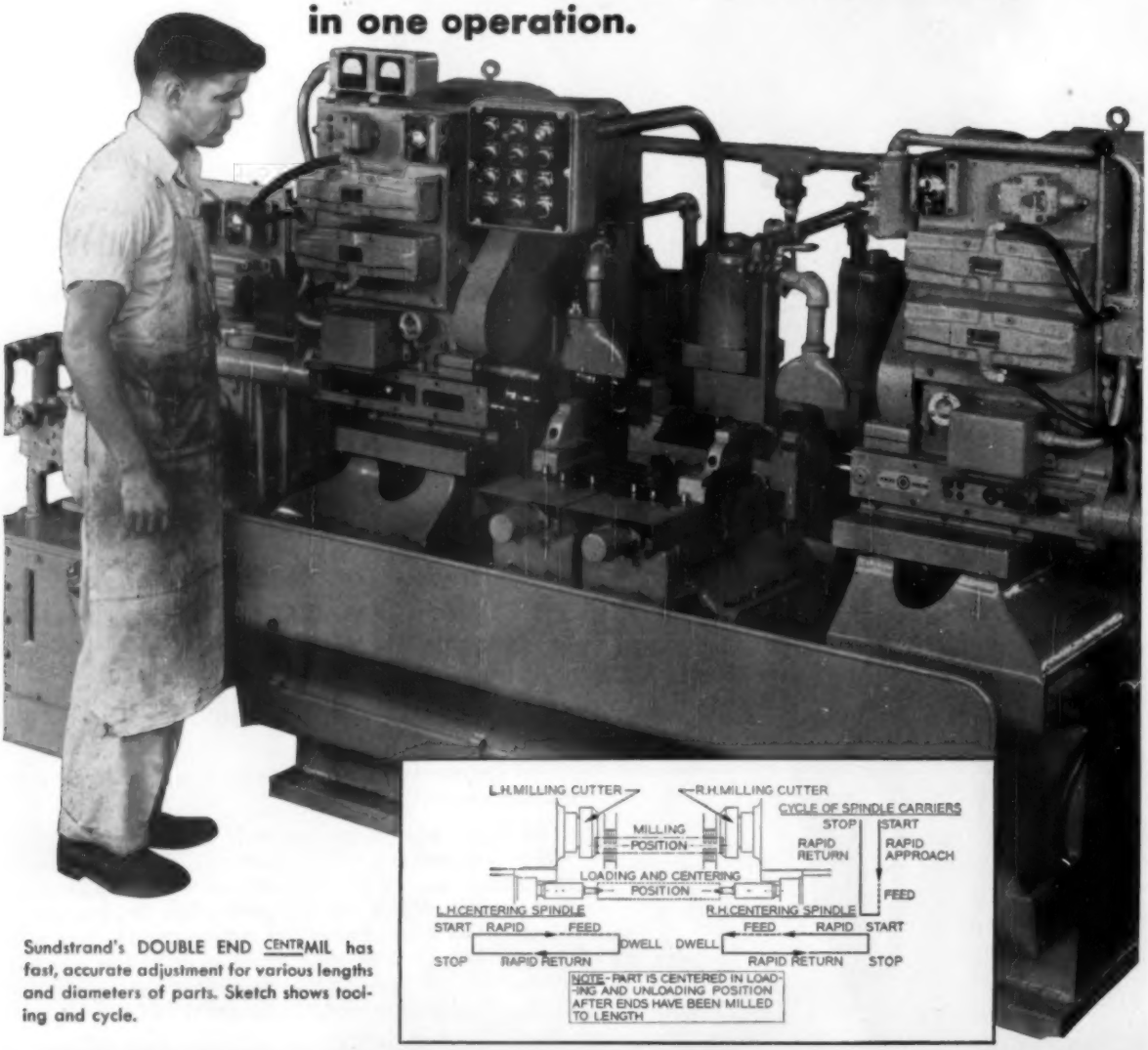
°Trade Mark Reg. U. S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

CINCINNATI° *Grinding Wheels*

Prepare your shafts for MORE ACCURATE TURNING

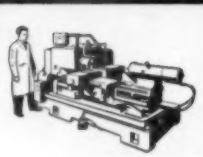
...by milling to length and centering in one operation.

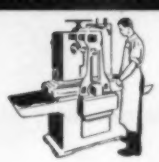


Sundstrand's DOUBLE END CENTRMIL has fast, accurate adjustment for various lengths and diameters of parts. Sketch shows tooling and cycle.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





Maintaining a definite relation between the ends and centers is automatically controlled on Sundstrand machines for squaring ends and centering shafts. This is of particular importance in preparing shafts for tracer turning. Combined milling and centering is more accurate than conventional methods as it isn't necessary to re-chuck the work between the milling and centering cuts, and the centers are held square with the end of the shaft. Combining the operations also saves the handling time and the floor space ordinarily required for a second or more expensive machine. In addition to being accurate, the CENTRMIL is fast. Three basic types, a SINGLE END CENTRMIL, a DOUBLE END CENTRMIL, and a DOUBLE END BROACHING and CENTERING MACHINE are available.

The DOUBLE END CENTRMIL has fast, easy adjustment making the machine ideal for both long and short parts in long or short runs. The automatic cycle of Sundstrand CENTRMILS can be combined with automatic loading and unloading for parts like automotive camshafts and similiar high production jobs.

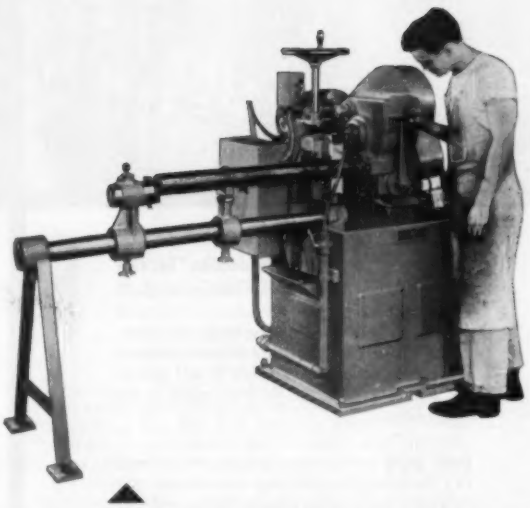
The SINGLE END CENTRMIL is ideal for the steel stock room or lathe department for miscellaneous small lot shaft work. Just a few simple adjustments and the machine is ready for individual pieces or small lots.

DOUBLE END BROACHING and CENTERING MACHINE provides the most practical machine for extremely high production. Low cost of tool per piece and high rate of production makes broaching the most economical method for high volume work.

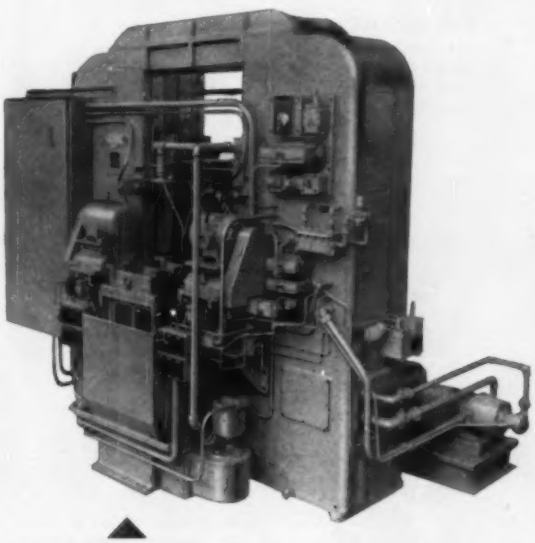
INCREASED PROFITS...

through improved accuracy and increased production are yours when you apply Sundstrand "Engineered Production" to your shaft work. More details are available in Bulletin 180.

WRITE FOR YOUR COPY TODAY!

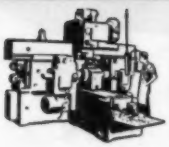


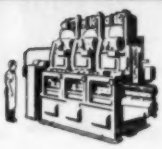
A typical example shows one manufacturer using a SINGLE END CENTRMIL, saving 65 out of 105 minutes on a lot of 40 pieces compared to previous method of facing to length and centering



BROACHING and CENTERING machine handles main transmission shaft forgings, two at a time, at the rate of 326 per hour.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

"Engineered Production" Service

FOR BROACHING

It takes all 3

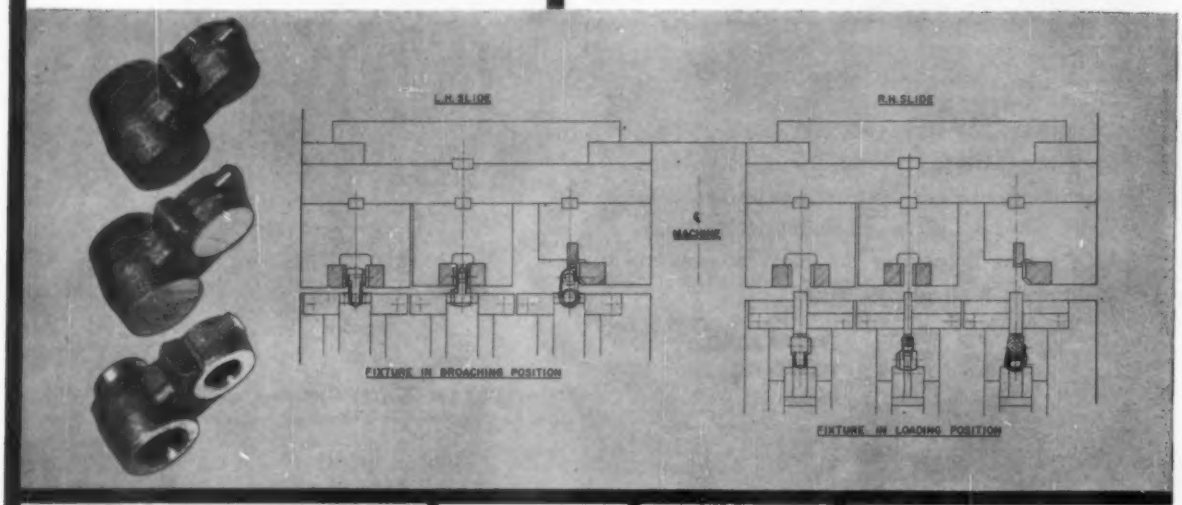
American's *"Engineered Production"* Service . . . gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

THE JOB — Three operations required: (1) Straddle broaching hub ends; (2) Straddle broaching toggle pads; and (3) Broaching vee notch and end surface on pawl end of lever. Parts are forged SAE-1018 steel levers for transmission parking pawl toggles.

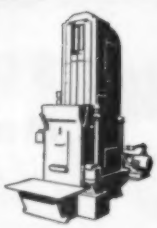
THE RESULT — 250 completed pieces per hour. Two hydraulically operated, tilting-type receding tables are used to hold six parts on a dual ram surface broaching machine.

1 PROPER BROACH TOOL DESIGN

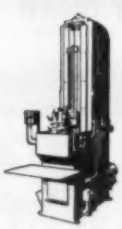
Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish tolerances required, etc. High-quality work and long tool life result because broach and machine are designed to operate as a team. A single pass of either multiple tooled ram on this machine performs three different broaching operations on three parts.



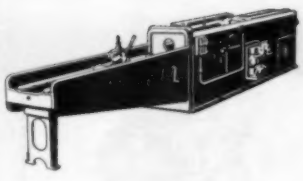
Broaching Tools



Three Way



Single Ram

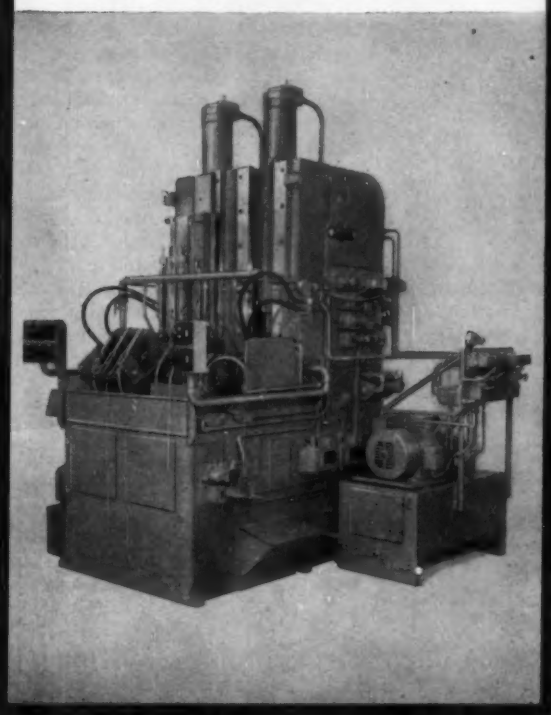


Horizontal

to give you peak broaching performance

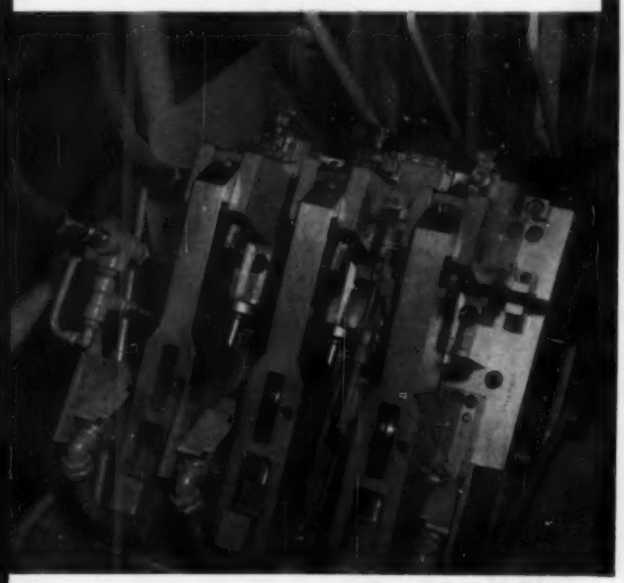
2 SPECIFYING THE RIGHT MACHINE

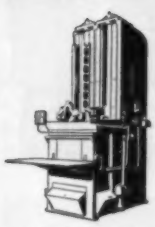
Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc. determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. The vertical hydraulic dual ram surface broaching machine shown, provides a separate hydraulic circuit for clamping, which is electrically interlocked with machine cycle for fast automatic operation.



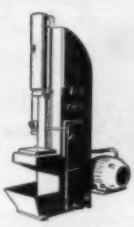
3 EFFICIENT FIXTURING

Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Close-up, showing LH fixture only, has three parts in place ready to be broached. Fixturing on the RH ram is identical. One fixture is unloaded and loaded during the broaching stroke of the other ram, providing the most practical method. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.





Duplex Ram



Presses

For more information on practical broaching methods, write for Bulletin A115.

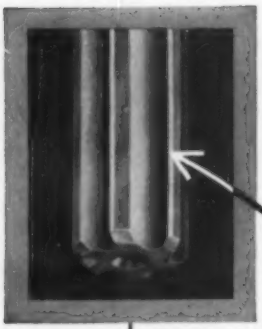
SUNDSTRAND

American

BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS



This edge cuts reaming costs

L+I gives you the edge on production

Call your L+I distributor

The Reamer Specialists

L&I

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, NY 36, N Y

Selective Plating

Dear Sirs:
We would appreciate receiving the name of the Canadian concern which handles the selective plating process that "makes it possible to deposit almost any metal on another metal in finely controllable thicknesses" (*AM*—May 6 '57, p97).

We are extremely interested in a simple process of selective-area plating.

H G Burger
Atlanta, Ga

Dear Sirs:
. . . Our Engineering Department noted this and is very anxious to obtain more information about this new Canadian process. Will you please send us any information you may have on this article, such as where you obtained the information and anything at all that might be of help to us in obtaining more information. . . .

J Brailey
Burlington, Mass

Dear Sirs:
. . . Kindly advise us how we can obtain additional information. . . .

H J Meyer
Great Neck, N Y

This process for selective-area plating is known as the Dalic Process. For further details, write to Mr H Denis Hughes, Pres, Dalic Metachemical Ltd, 121 Judge Road, Toronto 18, Ontario, Canada—Ed.

Small Cars

Dear Sirs:
Here's hoping the small, inexpensive car planned by Studebaker-Packard (*AM*—May 6 '57, p101) catches on with the public. It will be a special blessing if they maintain the same basic styling for a reasonable time. Then, maybe the owner can get a decent amount of use out of his car before he is made to believe that his neighbors are talking about him behind his back. We seem to have reached the point where transportation is one of the *minor* considerations in purchasing an automobile.

Maybe, with a longer production run on their tooling, S-P will be able to get the costs down and give the public a really good buy. That would be a much greater service to the customer than

SHOPMATES

N. Jarvis

THE WARP IS JUST STANDIN' THERE THINKIN'... NERVOUS NATE THINKS HE'S BEIN' WATCHED!! PRETTY SOON THE STRAIN'LL BE TOO MUCH AND NATE WILL GO OUT FOR A SMOKE AND LEAVE 'IM STANDIN' THERE LOOKIN' FOOLISH!
NATE IS HALFWAY BETWEEN A SWEAT AND A SWOON... HE FIGURES HE GOOFED... IT AIN'T WHAT HE GOOFED... BUT WHICH ONE HE GOT CAUGHT AT!
N. JARVIS

Mighty productive this

Cincinnati FLAME-HARDENED HARD CLAD® COLUMN Radial

With its 3′ arm and 7½″ column . . . its 1¼″ capacity in cast iron . . . its 9 "right" spindle speeds and 6 power feeds . . . this new Cincinnati Radial will take on a multitude of drilling and allied jobs in your shop.

And it's *Cincinnati* engineered to give you extra years of high-productive service. The "Hard Clad" column is flame hardened to retain its built-in accuracies without scoring or pitting. Steel gears in speed and feed transmissions are hardened to provide maximum wearing qualities. All shafts are mounted on anti-friction bearings.

Cincinnati research, Cincinnati engineering are fully reflected in this advanced-design radial which combines high performance with low first cost and even lower maintenance cost. For the complete Cincinnati Radial story, see your local CL&T dealer or write direct for catalog data. Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio.

center on

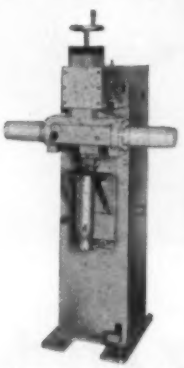
cincinnati lathes and drills

Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a Complete Line of Drilling Machines

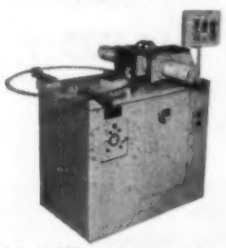
for
✓ Marking round surfaces
✓ Marking flat surfaces
✓ Precision graduating
✓ Serial numbering
✓ Knurling

Model 46-354 marks bearing races 1" to 6" in diameter. Cyclomatic Control and air ejection require operator merely to load piece parts.

The NOBLEWEST Series 46 is a truly new concept in universal roll marking. Its *Dual-Function Head* incorporates a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll marking. Combined in one integral unit, this new design offers wide flexibility in *machine design*—and *work capacity*. As illustrated, the *Dual-Function Head* can be mounted horizontally, vertically or at an angle . . . thus permitting a wide range of product application. Like all its famous predecessors, it employs the original NOBLEWEST roll marking process—producing sharp, permanent, indented impressions—*good for the life of your product*. Whatever your needs for metal marking, NOBLEWEST makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. For new comprehensive catalog, write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.



Model 46-382 (Vertical) marks flat surfaces from shell cases to kitchen utensils with equal facility.



Model 46-387 marks large diameter jet engine rings and similar parts.

MARK IT BEST WITH
NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

trying to yank his car out from under him (psychological obsolescence) as soon as he's broken it in.

James Wilson
Philadelphia, Pa

Drafting From 'Way Back

Dear Sirs:

In studying a pamphlet on "Standard and Simplified Drafting Practices," published by J H Bergen, Standards Administrator, American Machine & Foundry Co, I encountered a reference to an article on "The History of Drafting," by George F Summers, (*AM*—May 21 '14, p895).

Since this article was published almost a year before my birth, it may be said with some justification that my file of *American Machinist* back issues is somewhat deficient for that period. I wonder, therefore, whether it might be possible to obtain a reproduction of this article without any inconvenience on your part. Your cooperation will be appreciated.

Walter O Rulf
Waterbury, Conn

Of course, we don't have any loose copies of the article lying around after all these years, but we can supply photostatic copies from our bound volumes at 40¢ a page for anyone who is interested in this service.

The article that Reader Rulf

Helpful Henry

by L. Hoppes

"Hey, Boss, Ed's wife sent along a luscious looking piece of apple pie! —wanta try it?"

asks for turned out to be a short two-pager. Obviously, in that amount of space, it couldn't be a scholarly and complete history of the subject, but it does have a few interesting points which we have excerpted below—Ed.

"When Tubal-Cain started his blacksmith shop upon the plains of Mesopotamia a good many years ago, it is hardly to be thought that he had a complete drafting-room equipment among his assets; at least, history is silent on the matter. It is generally supposed that his methods were too primitive to warrant this refinement. But there is another reason besides this: He either did the work himself, or it was done under his personal supervision, and the need for written orders from the employer to the workman did not exist. . . .

"In the middle of the nineteenth century . . . the machinist was given a picture of what he had to make, and the exact dimensions were left to his judgment. His ability to work out the details when once he understood what was wanted was part of his education and training.

"Blueprinting at that time was unknown. Drawings were made on white drawing paper, and, as there was no means of duplicating them, great care had to be taken not to get them soiled. It was considered part of a draftsman's training to be able to shade his work in water color, and in consequence, drawings of that day were extremely pleasing to the eye. . . .

"As a result of . . . changes, the picture of yesterday has developed into the draft of today.

"The most important items in the make-up of a drawing are the figures. The drawing consists of two parts, the shape and the size. The form is soon told, but the size is what makes or unmakes the work.

"The drawing is an order from the employer to the machinist. Like all orders, it should be clear and concise and so complete that it needs no explaining. It should leave no point in doubt, and it should leave no opening for a dull intellect to go astray.

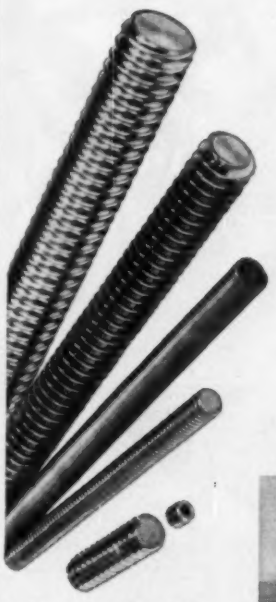
"Each line in the drawing is eloquent of studied effort to raise the standard of the work and systematically decrease the cost of the drawing."

REED R.T.D. Co.

Thru-feed Thread Rolling

for Continuous Precision Threading of Long or Short Bars and Tubing and Short Headless Parts

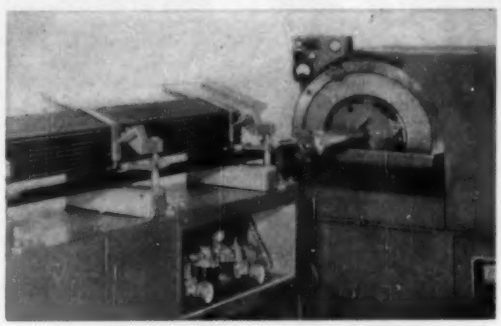
DIAMETER CAPACITIES—¼" to 3"



Hollow and Solid Parts Threaded by Thru-feed Rolling

REED MACHINES

Provide Uniform Pitch Diameter and Accurate Thread Form Over the Entire Length of the Threads



Thru-feed rolling may be used for threading both solid and hollow pieces of varying lengths and materials. Various forms may be rolled, including worms and Acme threads. Headless pieces, with threads running the entire length, may be threaded in bar lengths and then cut up into desired finished lengths.

Machines may be arranged for both manual and completely automatic loading and unloading of the parts . . . the rolling cycle with either method of loading is fully automatic. The work blank is rolled between cylindrical dies and is finally discharged at the rear of the machine. Short, headless pieces may be loaded into a chute and automatically fed, rolled and discharged. Controls are available that permit rolling the entire length, ends or middle section of a part.

Reed thread rolling machines are made in 2 die horizontal and 3 die horizontal and vertical types for thru-feed and in-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Operating handbooks are available so the tool engineer and operator can set up his own applications.

Write for Thread and Form Rolling Bulletin 159

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

FASTEST WAY TO MAKE SMALL PARTS AND DIES

STARRETT precision ground FLAT AND DIE STOCK

Just lay it out and saw it out . . . that's how Starrett Precision Ground Flat Stock and Die Stock helps you handle those many special jobs that now tie up valuable men and machines.

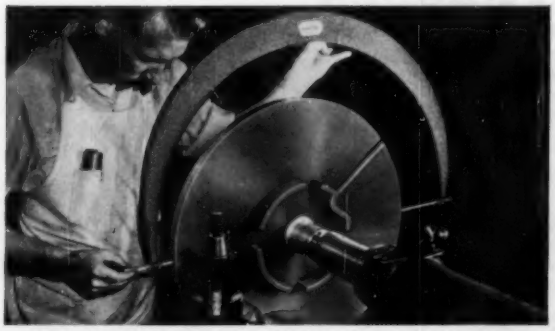
Fixture parts, special tools and gages, stamps, dies, cutters, templates, machine parts . . . anything with two flat, parallel sides can be produced quickly and economically from Starrett Precision Ground Flat and Die Stock. Over 1000 sizes in four types let you choose the exact width, thickness and hardening characteristics to suit your needs.

Your Industrial Supply Distributor carries Starrett Precision Ground Flat and Die Stock. He also stocks the complete line of Starrett mechanics' hand measuring tools and precision instruments, steel tapes, steel rules, dial indicators and gages, hacksaws, hole saws, band saws and band knives. You can get all of these quality products from one convenient and reliable source of supply.

WHEN YOU MEAN PRECISION YOU SAY STARRETT

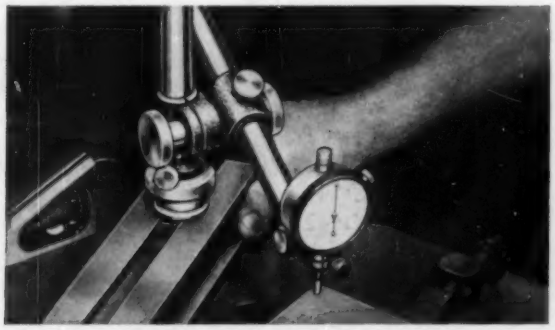
OTHER FINE PRODUCTS MADE BY STARRETT

"The Name You Know and Trust"



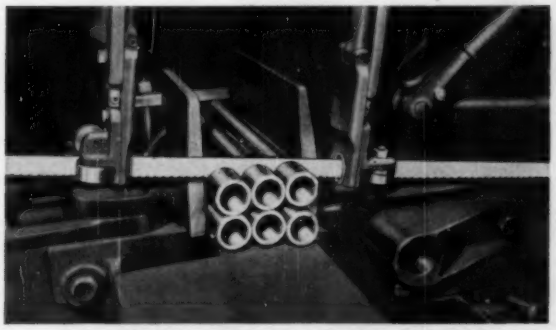
MECHANICS' HAND MEASURING TOOLS — STEEL TAPES, STEEL RULES AND PRECISION INSTRUMENTS

The name Starrett on tools is the hallmark of precision — a guarantee of accuracy, fine workmanship and complete dependability.



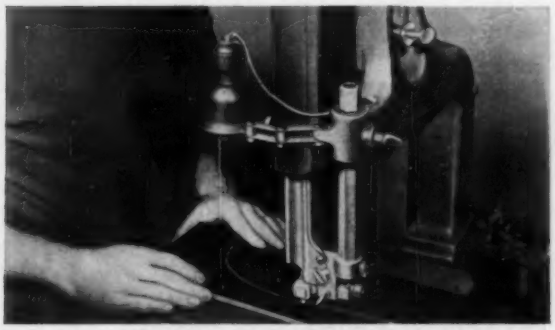
DIAL INDICATORS AND GAGES

Standard for quality and precision — a complete line for every gaging or production inspection application.



HACKSAWS, HOLE SAWS, BAND SAWS AND BAND KNIVES

Precision made by the World's Greatest Toolmakers for top performance, uniformity and maximum cutting economy.



PRECISION GROUND DIE AND FLAT STOCK

Made in four types, all sizes — air, oil, oil or water, and water hardening. Look for STARRETT, the mark of precision, on every piece.

BIG NEW CATALOG NO. 27

Describes and illustrates the complete Starrett line.

Ask your Industrial Supply Distributor or write for free copy. Address Dept. C, The L. S. Starrett Company, Athol, Mass., U. S. A.

Starrett

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

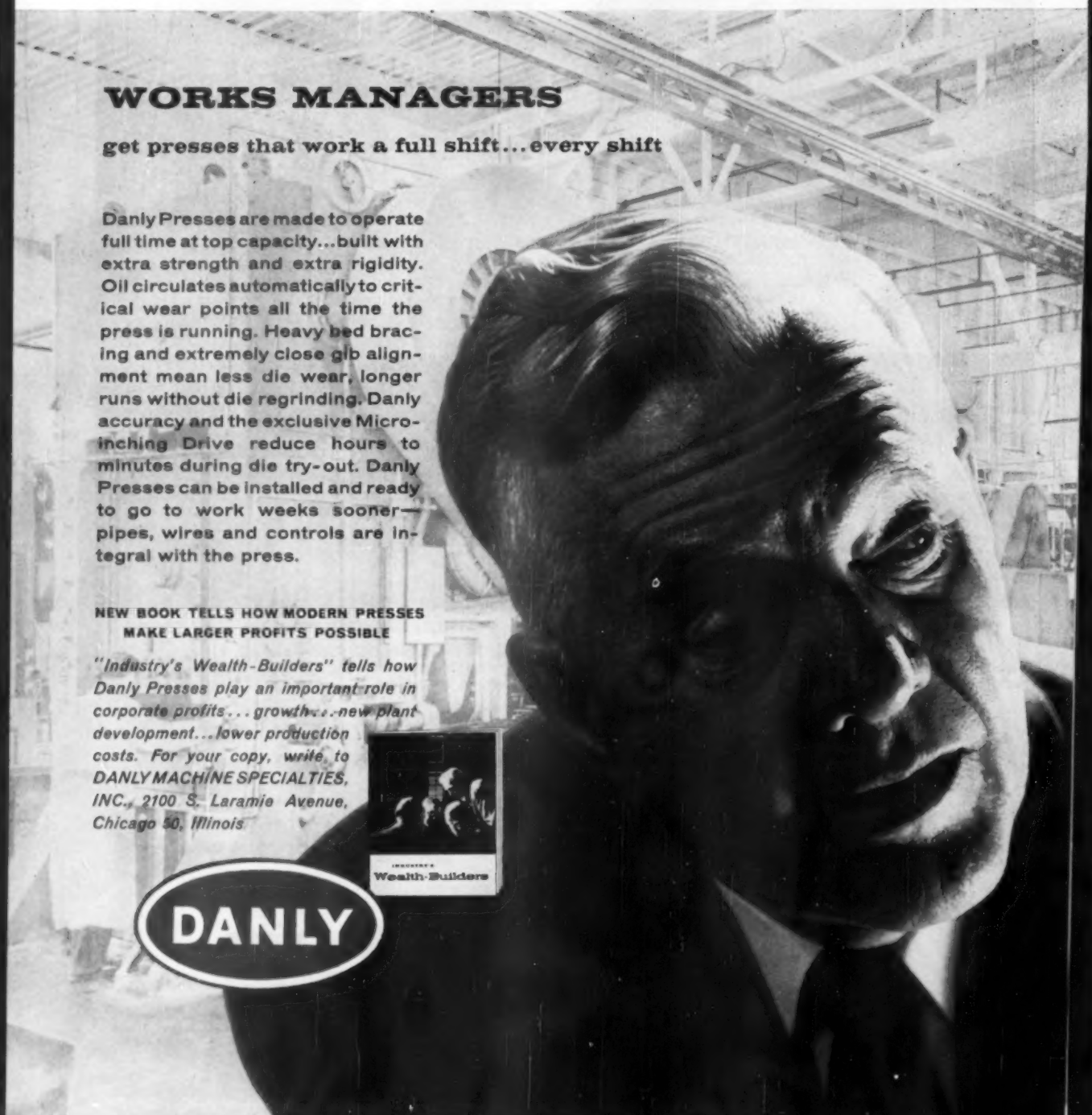
SINCE 1880
WORLD'S GREATEST TOOLMAKERS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

You get what you want with

DANLY

PRESSES



WORKS MANAGERS

get presses that work a full shift...every shift

Danly Presses are made to operate full time at top capacity...built with extra strength and extra rigidity. Oil circulates automatically to critical wear points all the time the press is running. Heavy bed bracing and extremely close gib alignment mean less die wear, longer runs without die regrinding. Danly accuracy and the exclusive Micro-inching Drive reduce hours to minutes during die try-out. Danly Presses can be installed and ready to go to work weeks sooner—pipes, wires and controls are integral with the press.

NEW BOOK TELLS HOW MODERN PRESSES MAKE LARGER PROFITS POSSIBLE

"Industry's Wealth-Builders" tells how Danly Presses play an important role in corporate profits... growth... new plant development... lower production costs. For your copy, write to DANLY MACHINE SPECIALTIES, INC., 2100 S. Laramie Avenue, Chicago 50, Illinois

DANLY

Spot news...

- **Retraining of semi-skilled and unskilled workers for automation** will be a big factor in UAW bargaining-table demands in 1958. The auto companies, which have the facilities to retrain workers, aren't expected to resist much, but it's the small automotive supplier industry shops that will feel the pinch of retraining and absorbing workers.

- **Automatic hardness tester that makes 900 tests an hour**—Rockwell, Super-Rockwell, Vickers or Brinell—has been developed by Karl Frank GMBH of Germany. Machine can do either single tests or mass tests.

- **Machine tool replacement has 40% of depreciation funds allocated to it** by Textile Machinery Works, Reading, Pa, knitting machine manufacturer and job shop. Results: average age of equipment is 11 years, and a high level of employment is maintained.

- **Stainless steel can be tinned and soft soldered as easily as copper** or bright mild steel with a new solder paint developed by England's Perdeck Solder Products Ltd. It is painted onto metal, then heated to normal soldering temperatures. Advantages: no wetting problem, good degreasing and penetration properties for metals with contaminated surfaces.

- **Buckling resistance of any sheet material is doubled** by a fabrication technique just developed by Calottan-Technik, Frankfurt, Germany. A pattern of hemispherical recesses and projections is cast or formed on the surface of a sheet of metal, plastic, pressed wood or glass, so that sheet has no preferential axis of inertia. Method also makes sheet 80-100% more impact-resistant.

- **Two important new developments in production of titanium:** (1) Illinois Tech has developed a new way to make titanium tetrachloride with higher purity, and at less cost—and it's said the process allows use of new low grade ores; and (2) three firms have combined to develop a consumable-electrode vacuum remelting furnace that melts titanium, zirconium, high alloy steels, etc—producing metals of highest purity and improved physical properties.

- **A 4000-ton hydraulic aluminum forging press with side rams** is now being employed by Harvey Aluminum at Torrance, Calif, to produce complex shapes and parts incorporating undercuts or backdrafts. The 1.23-million-lb press allows attachment of split dies to side cylinders while the vertical ram performs a forging or piercing operation. Also, conventional dies can be installed on main ram, allowing side rams to do press bed and piercing jobs.

- **Air Materiel Command urges manufacturers to become more familiar with QPL,** its "Qualified Products List Summary," which lists approved products that can be called for in AF contracts. Because many manufacturers fail to get their products on the list, they are overlooked at contract time. You can get data from Air Materiel Command, Wright-Patterson AFB, Ohio.

- **State of Maine may insure mortgages on new industrial construction** if the people of Maine okay it in a referendum this September. State would insure up to 90% of the cost of a building.

Spot index to major News stories...

Connecticut Lights a Fire Under Apprentice Training 170
Cutting Back Machine Tool Costs 174
"No Time for Obsolete Defense Thinking" 177
What Could Happen to Your Plant in War? 175
Washington 107
Detroit 109
Machine Tools 111
What's Ahead in Metalworking 115
in Business 116
Gaging Surplus Machinery 324

Showing parts mounted in the chuck. Without chuck changes, any of three parts having different exterior forms but identical interior contours can be accommodated.

12 operations are performed in one machine cycle. Heavy lines denote surfaces machined.

Intricate contouring is fast, accurate—

12 operations in one cycle!

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with accuracy, versatility and speed in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

Cams can be changed in minutes. Cam assembly swings out for quick, easy change. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base. Contact your Ex-Cell-O representative or write direct for complete information.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-62

XLO

EX-CELL-O FOR PRECISION

At left: The Ex-Cell-O Styled 312 Cam Operated Precision Boring Machine. A smaller model, the Ex-Cell-O Style 308, is also available because of the demand for this type of machine.

Washington ... NEWS REPORT

Military Spending to Remain Up...

Despite the clamor about military appropriation cutbacks, defense spending will remain at the current high level—or higher—next year and maybe longer.

This seems to be overlooked in the hullaballoo over the House's $2.6-billion reduction in the administration's fiscal 1958 request for new defense funds (half of which the Pentagon is asking the Senate to restore).

For the past four months, military expenditures have been running at an annual rate of $42 billion—well over the anticipated level. Total spending for fiscal 1957, ending this month, will hit upwards of $38.5 billion—at least $2.5 billion over the administration's original budget estimate. This can go on even though appropriations are cut because of heavy "carry-over" funds, money appropriated in previous years but still not committed. Close to $11 billion is being carried over to fiscal 1958; $8.1 billion or more will be carried over to fiscal 1959.

Reasons for the unanticipated high spending level: (1) shortened lead-times on several development and production projects; (2) price-wage hikes passed on by suppliers; (3) the faster, improved accounting procedures under which contractors are sending in their bills—and receiving payment; (4) crash programs for ballistic missiles.

The administration has ordered the Pentagon to hold expenditures in fiscal 1958, starting next month, close to $38 billion, the spending level originally set in the new budget—or else.

To carry out the order, Defense Secretary Wilson has issued two controversial procurement directives which are stirring up a ruckus in current Senate appropriation hearings.

The first directive holds back $500 million worth of new contract awards that were to be let this month (out of a total hardware procurement program of some $20 billion for fiscal 1957 as a whole).

In effect, the order will delay, but not necessarily kill, the contract awards for several months, thus postponing deliveries—and cash outlays from the Treasury—originally set for next year. It will also put the damper on free-wheeling contracting, common in the last month of a fiscal year as procurement agencies rush to use up authorized funds still not committed.

The second Wilson directive, more far-reaching in nature, is aimed to limit "installment buying" by the Services, notably the Air Force. Under the new policy, the Services cannot place any contracts on a procurement project—say, for 100 bombers—until money to pay for all the planes, spare parts, tooling, and other costs has been appropriated by Congress and apportioned out to the Services by the Budget Bureau and the Defense Comptroller.

In the past, the Air Force has awarded contracts piece-meal as money was made available in partial amounts—one for a dozen or so planes, then another for a new batch of aircraft, another for spare parts, and the like. But the Air Force will still be able to buy long lead-time engines in advance of the airframe.

The Air Force is up in arms over the second Wilson directive, calls it a "stretchout" order, claims that scheduled plane and missile procurement may have to be reduced as much as $2-$4 billion next year.

Wilson hasn't yet spelled out details on the new policy, but has said there'll be exemptions—such as ballistic missile development—to it. The Air Force, backed up by Senator Symington, its strongest supporter on the Senate Appropriations Committee, says that a strict interpretation of the new policy would mean serious cutbacks in production of the McDonnell F-101, Lockheed F-104, Republic F-105, and Convair F-106 supersonic fighter planes, possibly cancellations for other contracts.

Du Pont-GM Decision...

No one expects a brand-new rash of antitrust cases out of the Supreme Court's decision against Du Pont's holding 23 per cent of General Motors' stock. But the antitrust lawyers have gotten a tremendous leg up from the decision, there's no doubt about that. They think the Court's majority opinion has strengthened the practical impact of rather fuzzy language in the law to the point where it will make it easier for them to win cases involving corporate relationships between buyer and seller.

Such vertical integrations have up to now been more or less on the sidelines as far as antitrust prosecution is concerned. Now, the government lawyers say they can go ahead with cases that heretofore have been considered marginal, and hence not filed at all.

Certainly the decision makes it easier for the government to bring cases—and win them—based on a showing that the stock acquisition may have kept a competitor out of a given market. The majority has ruled that these stock acquisitions are illegal "whenever the reasonable likelihood appears that the acquisition will result in a restraint of commerce or in the creation of a monopoly in any line of commerce."

PRECISION PERFORMANCE.

To the high diver, precision performance means the graceful and faultless execution of even the most difficult, intricate dives.

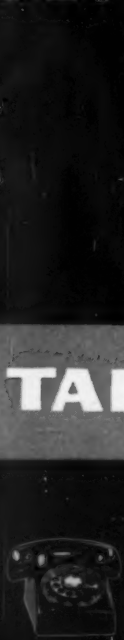
To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

BAY STATE TAPS

Bay State Tap & Die Company

Mansfield, Massachusetts

On the nearby shelves of your Industrial Supply Distributor



Detroit ... NEWS REPORT

Healthy in spite of the moans . . .

Although automakers moan and grieve over the loss of the spring market for the second successive year, production is still healthy.

May schedules, when final figures are in, will show that production came to within 2% of estimated totals for about 535,000 units.

June, traditionally the beginning of the summer slackoff, is scheduled to roll up 518,000 to 520,000 units—a figure that one economist says is "staggering for that month."

The first quarter of 1957 ran about 2.9% above the first quarter of 1956, and the second quarter of this year-of-no-spring-market looks now as if it will run a solid 10% above 1956.

Production figures for the second quarter of 1957 are pegged at a solid 1.6-million units (1956 second quarter total was 1,449,664 units).

And this leads to a lot of speculation about what will happen in the third quarter.

Normally, auto companies start to slack off on their production schedules in the summer.

Word is out now that the selling season will be pushed hard well into the third quarter. This means that production schedules should hold up fairly well. And to offset increased 1957 model inventories in dealers' showrooms, the factories will initiate new and bigger incentive plans.

Fourth quarter production will, as always, be just as high and as hard as automen can make it. A rash of new models for 1958, led by Ford's all-new Edsel, will open up a lot of pocketbooks just starting to bulge again with auto money.

How they'll work . . .

Plymouth will run on Saturdays, at least through June, and possibly through July if sales manage to keep up to present levels. Plymouth, through the first four months of 1957 succeeded in capturing almost 11% of the total car market.

Dodge, running ahead of last year's market penetration, will work a five-day week in June.

Chrysler and Imperial have been hard hit by Budd Co wildcat strikes, and production has fallen off drastically. The strikes are now over and it is likely that Imperial, if not Chrysler, will accelerate its output considerably.

At Ford Motor, the entire firm now enjoys a market penetration of better than 30%, with Ford continuing to edge out Chevrolet. Mercury is running ahead of 1956, but Lincoln, perhaps feeling the pinch of the rambunctious Chrysler Imperial, is down from a like period in 1956.

Thinking in Detroit is that Chrysler's Imperial, a nameplate that sold only 12,130 units in 1956, may hit 70,000 units annually in 2-3 years.

At General Motors, Chevrolet is beginning to creep up on Ford, but its total output for the first five months of 1957 is running behind 1956.

Carrying the production ball still for GM are Pontiac and Cadillac, with both lines running just a hair under 1956 figures. Buick and Olds are picking up steadily, although they're still well under 1956 figures.

American Motors' Rambler production is holding up well—down only 10% or so from the first four months of 1956. Nash and Hudson output, however, has sagged to a fraction of '56 totals.

At Studebaker-Packard production continues to fall, with hopes pinned on the "economy line."

Retraining for automation . . .

United Auto Workers have plans for retraining semi-skilled and unskilled workers to meet the demands of automation.

In essence, UAW says that if a worker is displaced because he can't meet the demands of automated equipment, it is up to the employer to retrain the worker for another job. If necessary, says UAW, the man will be trained on his own time and paid straight time or time-and-a-half.

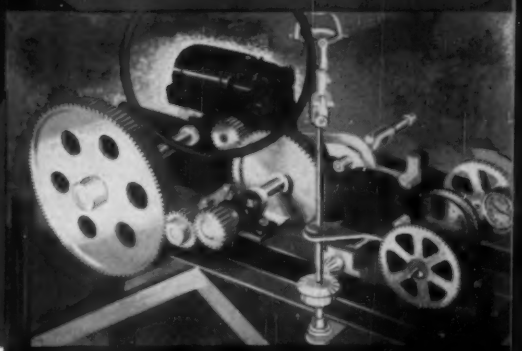
This training of men for new skills is not an insurmountable job for the auto industry, where it is possible to detach a man from his duties for a few hours a week to do classroom work.

But retraining is going to be a problem in smaller shops where classrooms are not readily available, and where production schedules won't permit taking a man off the job during work.

One such hypothetical case of a small shop was presented to a UAW spokesman for discussion. The company was represented as being forced by competition to modernize and automate extensively. Financially, the company was just barely able to meet the cost of buying the machinery and installing it. It couldn't afford to pay employees overtime wages for training on their own time, and had no training facilities.

What to do? Said the UAW man, "In this case the community should bear the cost of a training area—and if necessary the cost of salaries for the retraining periods." By community, he said he meant federal or local government.

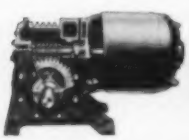
Nothing Cuckoo about this clock!



The "works" of a tower clock. ⅓ H.P., 115/230 volt, 60 cycle, 1 phase Master Right Angle Gearmotor supplies main drive with a synchronous output speed of 30 R.P.M.

You may not need clock drives, but time (production time) is a problem everywhere—and that calls for the most dependable, most efficient use of electric drives—like here! This clock, with 300 lbs. of hands and four 24-foot dials is powered by a Master Gearmotor driving a precision gear train. With that accurate Master drive, here's a one-jewel clock!

Are you sure you've got the right answer to your drive requirements? Master components can be integrated in any combination to give you the right horsepower, right shaft speed, right mounting features, in a single, efficient, compact unit. Now's the time to let us prove it.



MASTER ELECTRIC MOTORS

ANOTHER DRIVE REQUIREMENT MEETS ITS

MASTER

Motor Ratings	⅛ to 400 H.P. All phases, voltages, frequencies.
Motor Types	Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.
Construction	Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.
Speeds	Single-speed, multi-speed, and variable speed.
Installation	Horizontal and vertical, with or without flanges and other features.
Power Drive Features	Electric brakes (2 types)—5 types of gear reduction up to 432 to 1 ratio. Mechanical and electronic variable speed units—fluid drives—every type of mounting.

THE MASTER ELECTRIC COMPANY

Dayton 1, Ohio

Machine tools ... NEWS REPORT

Pressure to lift ban ...

Washington is under terrific pressure from the British, French and Germans to modify further or eliminate completely the list of machine tools banned for delivery to Russia and her satellites.

President Eisenhower's seemingly relaxed attitude toward resumption of trade with China by our allies has given added impetus to the demand for decontrolling sales of machine tools to the East.

There is formidable opinion in government circles in Washington that our present rigid policy is unrealistic and that the least that we can do is to reduce drastically the types of machines retained on the black list.

As long as the British and other western European nations intend to ship machine tools freely to the East, why should US builders be forbidden access to eastern markets? Thus the argument is put.

Perhaps few people realize that the present banned list is comprised of machine types which all the western allies have agreed not to sell to the communists.

If any member of the allied nations refuses to be persuaded that a certain type of machine should be on the list, it stays off the list and can be freely sold, no matter how strategic some of the nations regard it.

China trade still restricted ...

The British government is now willing to let British builders sell machine tools to Red China. This decision, however, does not mean that the industry can deliver any kind of machine to Chinese customers.

An embargo list for China still exists. It has been whittled down to conform to the list for Russia and other communist countries. Many machines on the list are in the elephant class.

These machines cannot be shipped to China or anywhere else behind the iron curtain: Apparatus specially designed for making or measuring turbine blades; vertical automatic-cycle boring mills with table diameter over 96 in.; deep hole drilling machines using tubular drills; external surface broaching machines.

Also gear cutters other than hobbers for 48-in. work or less; most precision grinders; multi-station honing machines; jig borers; center lathes exceeding 18-in. center height and 18 ft between centers.

Also combination tube boring and turning lathes; multi-spindle automatic lathes; right-angle T lathes; spinning lathes of 10 hp and up; 4-in. bar-capacity turret lathes with 24-in. swing over the bed; spar millers and all other machines specially designed for aircraft work.

Also planer millers and similar machines for work-pieces 6 ft wide or over and 20 ft long or over; thread millers with 6-in. thread capacity or over; presses over 1000-ton capacity; copying lathes and millers including profiling attachments; and electro-erosion machines.

China wants tabooed tools ...

Perhaps the lifting of the trade ban with China by the British has caused more hullabaloo than the amount of potential business justifies.

What China really wants to import are types of production equipment still on the tabooed list.

She can get from Russia and East Germany, as well as from other eastern countries, a considerable supply of standard general-purpose machines. In addition, China is now building some general-purpose machines herself.

It is hardly a secret in Washington that the US government attempted unsuccessfully to secure British consent to extending the list of China-embargoed machines to cover more types of equipment than it does.

Metalworking Division stays intact ...

Thanks to the good work that it has done, the Metalworking Equipment Division of the Business and Defense Services Administration has emerged unscathed and without any loss in manpower in the federal budget-cutting ruckus.

It still will have a staff of 14 people, including the director.

After December 30, if not before, it no longer will have a WOC (without compensation) man as director. Latest decree is that the director and assistant director of an industry division must be a full-time government employee. Men on loan from industry can serve only in an advisory capacity.

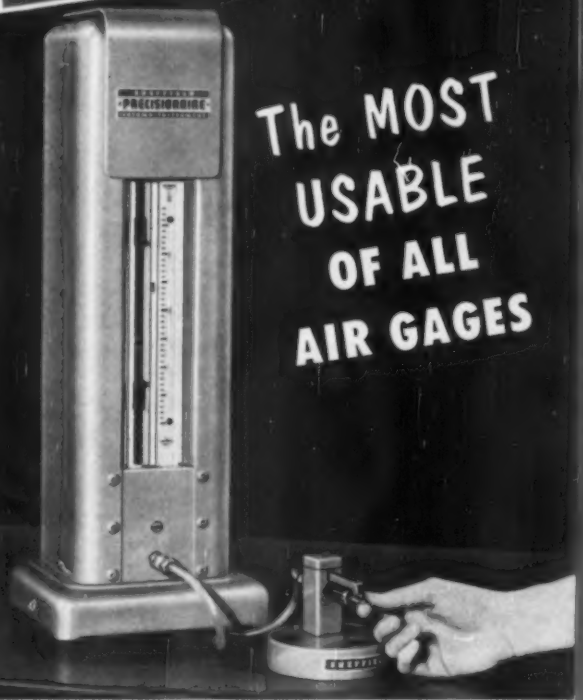
Mission on way to India ...

The machine tool mission to study the Indian market left on June 11 for India. Headed by George Merryweather, vice president, Motch & Merryweather Machinery Co, the mission hopes to complete the job within six weeks.

BF

The Most Economical

WITH SHEFFIELD'S PRECISIONAIRE



The MOST USABLE OF ALL AIR GAGES

CHARACTERISTICS

High precision with instant response

•

Has widest amplification range — 100 to 100,000-1

•

Accommodates widest tolerance range — .000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read — no need to squat and squint

•

Human error minimized

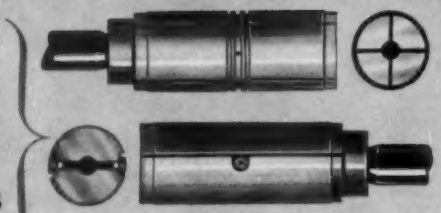
•

Checks one dimension or many simultaneously

•

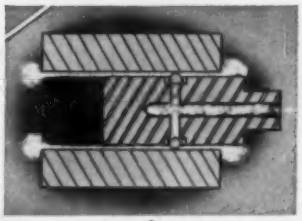
Elements have long service life

BASIC INTERNAL TOOLING ELEMENTS

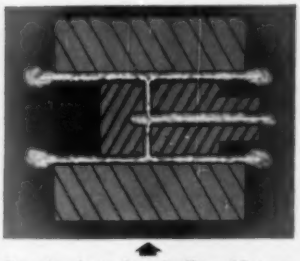


AIRJET SPINDLE

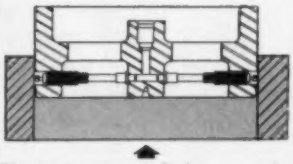
For True Diameter



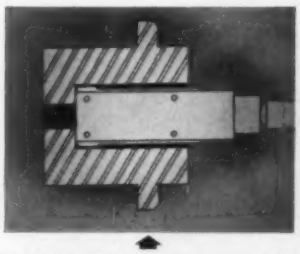
Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.



Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005" or less and surface finishes of less than 65 rms.

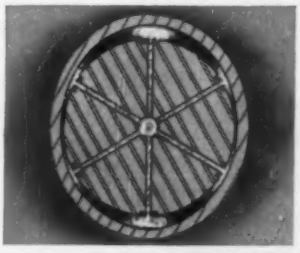


Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.



Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.

Adjustable spindles and kits are available to cover ranges of ⅜" to ⅞"; ⅞" to 1½"; 1" to 3"; 1½" to 3" and 3" to 12".



For Average Diameter

Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

7837

MORE PRECISIONAIRES BOUGHT . . . . . .

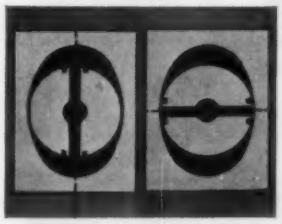
Way to Gage Holes*

BALLJET SPINDLE

BLADEJET SPINDLE

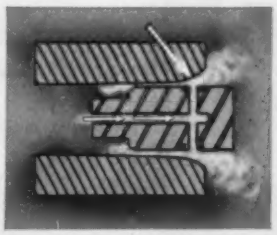
PLUNJET CARTRIDGES

For Out-of-Round



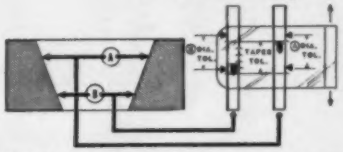
Indicated when any spindle is rotated through 90 degrees.

For Bell-Mouth



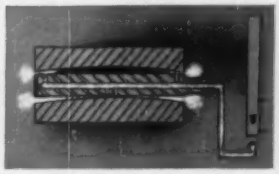
Indicated as any spindle enters or is withdrawn from the bore.

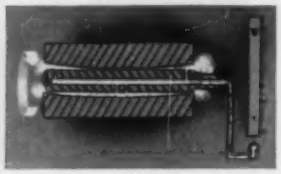
For Taper



Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

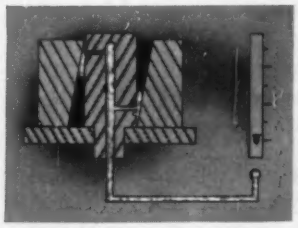
For Camber

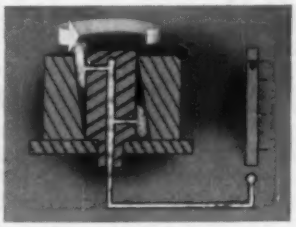


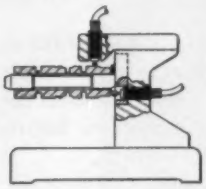


Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

For Squareness of a Bore Axis with a Face



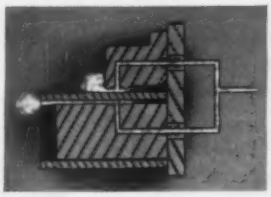




Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

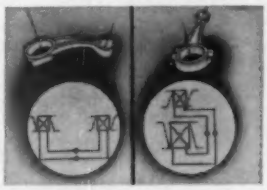
Plunjet fixtures may also be used.

For Concentricity



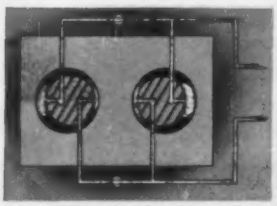
Opposed jets in a locating fixture.

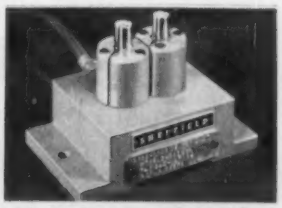
For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

For Center Distance Between Holes





By a fixture with two spindles each having two opposed jets.

*For checking external dimensions, relationships and countless other conditions, write to Div. I, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

the SHEFFIELD corporation

...surement for mankind

THAN ALL OTHER MAKES OF AIR GAGES

Combination spar and skin miller operating at one of the country's largest aircraft plants (Name on Request). *Texaco Soluble Oil* emulsions are used exclusively in these operations.

How Texaco Soluble Oils combine cooling capacity with anti-friction properties

Soluble oil emulsions are often considered just "coolants", whereas cutting oils, by virtue of their extreme pressure and wetting properties are selected mainly to reduce friction.

But you can combine the advantages of good cooling capacity and excellent anti-friction properties, by using *Texaco Soluble Oil*. For heavy duty operations, emulsions of *Texaco Soluble Oil HD* also contain extreme pressure characteristics which make them suitable for many machining jobs that formerly could be handled only by cutting oils.

For grinding, *Texaco Soluble Oil* emulsions fight the common tendency for wheels to load—keep machines cleaner. They emulsify readily with water—remain stable. And they provide protection against rust, even at high dilution.

There is a *Texaco Cutting, Grinding* or *Soluble Oil* to help you do better, faster machining, at lower cost. Ask your Texaco Lubrication Engineer to help you select the proper one. Just call one of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

What's ahead ... in Metalworking

NEWS REPORT

Production clings to peak levels...

Despite the tendency of many metalworking operations to sag a little, production clings to a position not far below the peacetime peak.

What's more, the summer gives promise of being very good. It won't have quite the same zip, however, that characterized the first half.

Capital goods producers are hard up against the fact that the volume of new orders has not matched production for some time.

There is little to support the hope that this situation will change in the immediate future.

This is not to say that the outlook is discouraging. Far from that. It actually is good and by normal standards an active period looms ahead. It suffers only by comparison with the superplush business of the past year or two.

Steel output up slightly...

Very slight advances in steel production—from 86.7 to 88.3% of capacity at latest report—are generally being attributed to some protective buying against the price rises that go into effect at the end of this month. Most protective buying has been in flat-rolled products.

This situation will hold through the rest of this month, but the big question mark is "what will happen in July and August?"

Some top steel officials believe that industry-wide steel production will slip to its lowest point in several years in the third quarter.

But, and it's a big but, these same steelmen believe output will pick up strongly in the fourth quarter, when the automotive and appliance industries, which are still liquidating sheet and strip inventories, start buying again.

Sheet and strip is in seven-month supply, alloy steel eight months, stainless 5½ months. Automotive market for stainless is off, but the aircraft market has increased up to 50% recently.

Foundry and stampings spotty...

Gray iron founders are voicing some complaints about business, which in the first four months of this year has been down 10% from 1956. But the industry is still producing more than 1 million tons of castings a month.

Some stamping plants are very busy and some are very hungry. Most of the pinch comes from the pull-back of stamping business into automobile companies' automated facilities. Thus the big independent stampers are now out after the business that once went to smaller shops.

Tool and die people report current orders are running behind comparable 1956, when April and May showed a big pickup. That pickup hasn't materialized so far this year. Most of the big automotive orders for 1958 have been delivered or are now being filled. Some orders are coming in for 1959 auto models.

New orders for production tools, supplies and equipment placed by industrial distributors with their manufacturers declined 3.5% in April, extending the moderate slideoff that has been under way since January. New Order Index, compiled by American Supply and Machinery Manufacturers' Association, was at 203 in April, compared with 221 in January.

176

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**176**	**177**	**179**	**171**
Machinery		**152**	**154**	**151**
Electrical Machinery		**196**	**204**	**209**
Autos		**126**	**135**	**129**
Other Transportation		**382**	**374**	**308**
Other Metalworking		**145**	**144**	**140**

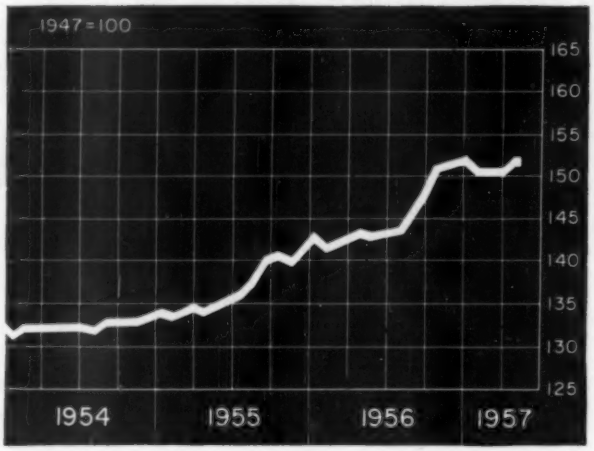
NEWS REPORT

What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**152.1**	**151.9**	**151.7**	**143.5**
Metalworking Machinery	**176.3**	**176.1**	**164.3**	
Other Machinery exc. Electrical	**160.6**	**160.3**	**149.5**	
Electrical Machinery	**153.9**	**153.5**	**141.2**	
Fabricated Metal Products	**143.5**	**143.4**	**137.8**	

152



Restraint is the keynote for 1957 . . .

It is now expected that consumer buying will show a marked increase in the second half of 1957 and in early 1958—even if most families exercise careful spending restraint and continue to salt something away in the bank each month.

At current levels of income, even a 1% drop in savings would mean a $3 billion increase in consumer spending. And if the public had an inkling that credit would loosen soon, or that a tax cut were in the offing, this could happen.

But it now looks as though the government will do little or nothing to add fuel to a revival of consumer buying in the next few months. The word from Washington is that the government will neither cut taxes nor ease credit this year. In fact, the Federal Reserve Board has publicly announced that it will continue to keep a tight rein on credit for some time to come.

Idea behind maintaining tax and credit restraints is that if consumer buying booms later on this year and business show a decided upturn, those same restraints will keep business under control.

Working, too, as a check against runaway inflation is the decided increase in competition in most industries, caused by substantial additions to production capacity.

And business has shown both wisdom and restraint in managing its inventories. Most firms this year are reversing the usual practice of piling up inventories when business is good. And while this has cut down on volume of goods produced, it puts a safe floor under prosperity.

When you recall that the only recessions in recent years have come at a time when inventories have been dangerously high, it is safe now to assume that the possibility of a major business setback any time this year is remote.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	144.9	143.8	145.6
Steel ingot production (thousand tons)	2,274	2,252	2,380
Electric power output (million Kilowatt hours)	10,936	11,574	10,598
Production of automobiles and trucks	110,461	158,654	108,252
Engineering construction awards (*Eng. News-Record*, millions)	$442.7	$298.9	$250.2

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	294	284	381
Vacuum cleaners sales (thousands of units)	313	431	396
Washers sales (thousands of units)	286	320	406
Household electric ranges sales (thousands of units)	86	79	110
Radio production (thousands of units)	1,011	1,265	1,360
Television production (thousands of units)	560	465	680
Gear sales index (1947-49=100)	262.4	239.5	276.5
Foundry equipment new orders index (shipments, 1947-49=100)	127.0	188.4	152.7

* Seasonally adjusted

Automatic feeding and setting with...

T-J

Speeds up riveting and clinching!

It's a quick step to *faster assembly* and *reduced labor costs* when you put T-J Rivitors and Clinchors in your production picture! These performance-proved machines are suited to a wide range of assembly jobs for aircraft, automotive, farm machinery riviting jobs of all kinds.

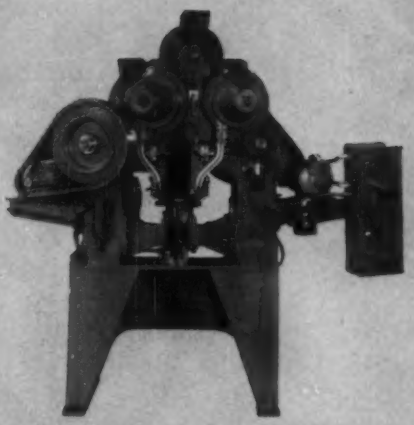
T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to 7/8" long. Throat depths 8" to 36".

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

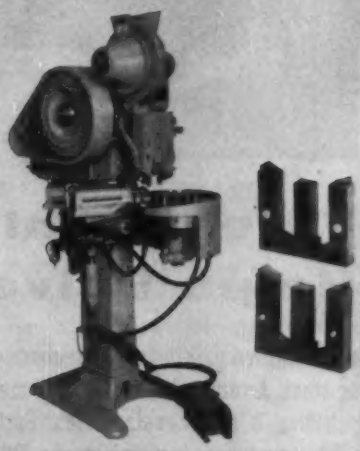
Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

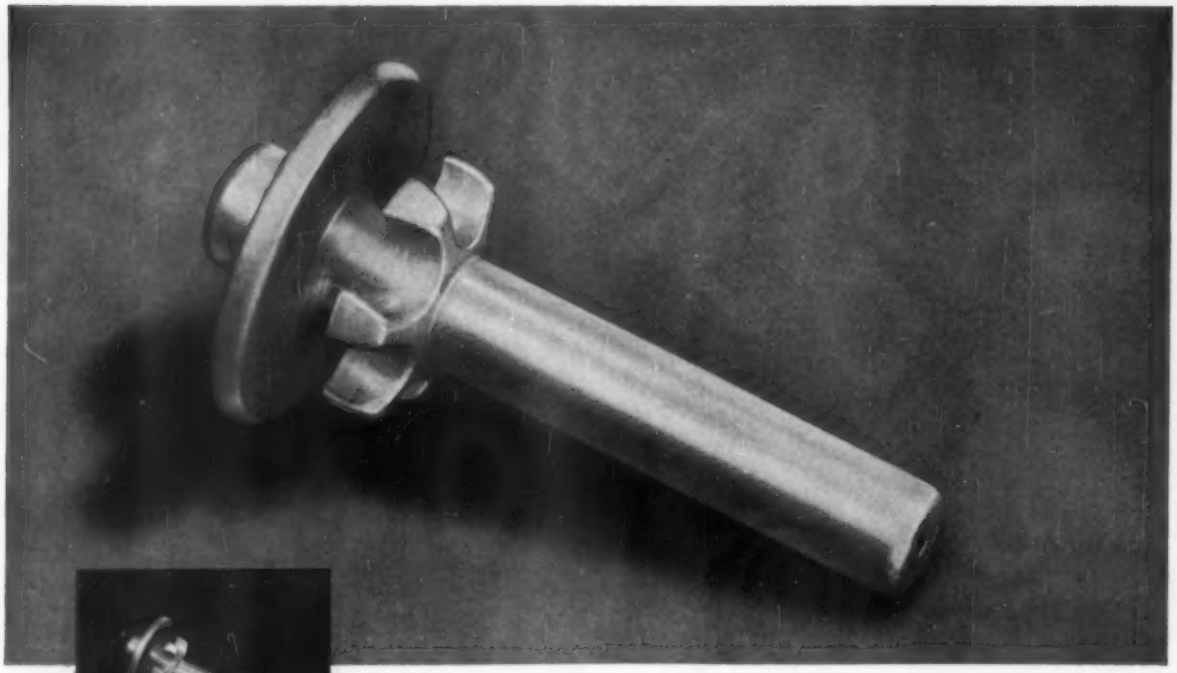


RIVETS 4 AT A TIME! Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.



SPECIAL TWIN RIVITOR! Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riviting laminated armature assemblies.

T-J CLINCHOR adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.



Actual Size

Free Machining Stainless Helps Solve Tough Automatic Job

From bar to finished part in only 12 seconds with Type 303 stainless steel. A total of 10 operations are required, including drilling 6 semi-circular holes. Surface finish is held to 20 microinches and tolerances .002" t.i.r.

This small part for a single lever kitchen faucet is typical of the wide variety of screw machine parts being specified in stainless steel. And it is typical of how Armco Free-Machining Stainless Steels can help you turn the toughest jobs into good profit-makers.

Among 33 standard grades of Armco Stainless Steel, there are more than a dozen free-machining grades. For almost any job you can select a free-cutting variety to help you boost production. And the uniform machinability of all Armco Stainless Steels cuts rejects and down time.

Cost-cutting Sizes and Shapes Available

You can make additional savings with Armco Stainless bars because they are available in a wide range of sizes in both standard and special shapes. The size you need and special shapes mean less bar stock to turn into chips . . . even the possibility of eliminating entire operations.

New Machining Film Available

Armco has a new 16 mm sound film that outlines recommended practices for both production and job-shop machining of stainless steel. You'll find a showing of "Machining Stainless Steel" useful in keeping costs down, quality and profits up on stainless jobs. It's available to you free of charge. Just fill out and mail the coupon.

Armco Steel Corporation, 1457 Curtis St., Middletown, Ohio

We would like to show "Machining Stainless Steels" on the following date _____ Alternate dates are _____ or _____.

☐ Also send us information on the available sizes, shapes and grades of Armco Stainless Steel bars.

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

ARMCO STEEL CORPORATION

1457 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

American Machinist

MAGAZINE OF METALWORKING PRODUCTION · ESTABLISHED 1877

Everything To Gain Taxwise

Poor old Bulletin F is having a tough time. Instead of letting it die a natural death, Internal Revenue has decided to inject hormones into it and give it renewed life.

Bulletin F, you will remember, is the document issued by Internal Revenue to its agents back in the 1930's setting forth the suggested useful lives of various types of production equipment. These life-spans, ranging from 15 to 25 years, were to be used as a guide by manufacturers in depreciating their machines.

A new, reinvigorated Bulletin F . . .

presumably setting forth shorter useful lives more in keeping with the rapid changes in technology, will emerge in a matter of months. It can hardly miss being an improvement over the decrepit, antiquated document that often has been called "the Bible of the revenue men."

But why rely slavishly on either the old or the new Bulletin F? You don't have to. In fact, if you possess logical and well-documented evidence to prove justification for a much shorter writeoff period, you would be derelict if you did not make use of it.

Even Bulletin F supports . . .

and even suggests, such action. It says that "taxpayers may determine reasonable periods of useful life for their depreciable property on the basis of the particular operating conditions, experience and informed judgment as to technological improvements and economic changes."

One word of caution: if you choose this procedure, it is subject to review by Internal Revenue and you should be ready to submit proof that the period of useful life that you have selected is justified. But don't let that scare you.

"Over the past 10 years I have faced revenue agents and have succeeded in obtaining their approval of my use of lives shorter than prescribed in Bulletin F," an executive of a metalworking company testifies. His company incidentally is not a giant corporation. It would fall within Washington's definition of small business.

The truth is that too many manufacturers have tended to take their depreciation rates directly from Bulletin F without making any real effort to determine the useful lives that should be applied to their own equipment in their own particular situations. Having done so, they then bewail the unfairness and lack of realism in Bulletin F's tables.

Instead of going through . . .

this dreary cycle, you should make it your business to find out exactly what is the useful life-span of the production equipment in your plant.

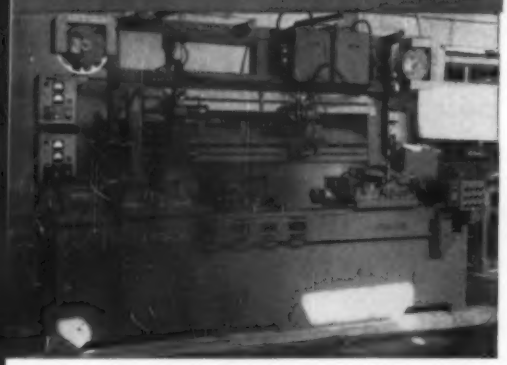
If it should prove to be much shorter than Bulletin F suggests, don't hesitate to depreciate your equipment accordingly. Just be sure that you have the facts and figures to back up your tax position. If you so act, you have everything to gain and nothing to lose.

Burnham Finney EDITOR

Accurate heavy cuts by this Cincinnati Rigid Shaper

. . . . at NATIONAL ELECTRIC WELDING MACHINES CO.

Bay City, Michigan



The steel slide being machined will be used on a National Automatic MIG arc welder, such as shown above.

Economical production of this steel slide for an automatic arc welder requires heavy cutting with maintained accuracy. The machine chosen for this job is a 16″ Cincinnati Heavy Duty Rigid Shaper. Some of the features which make this performance possible are:

- Extreme rigidity due to heavily ribbed column.
- Exclusive Cincinnati 50 PSI pressure lubrication.
- Maximum accuracy due to extended ram bearing and slot-free ram.
- Fast, easy operation due to electro-magnetic brake and clutch with finger-tip control.

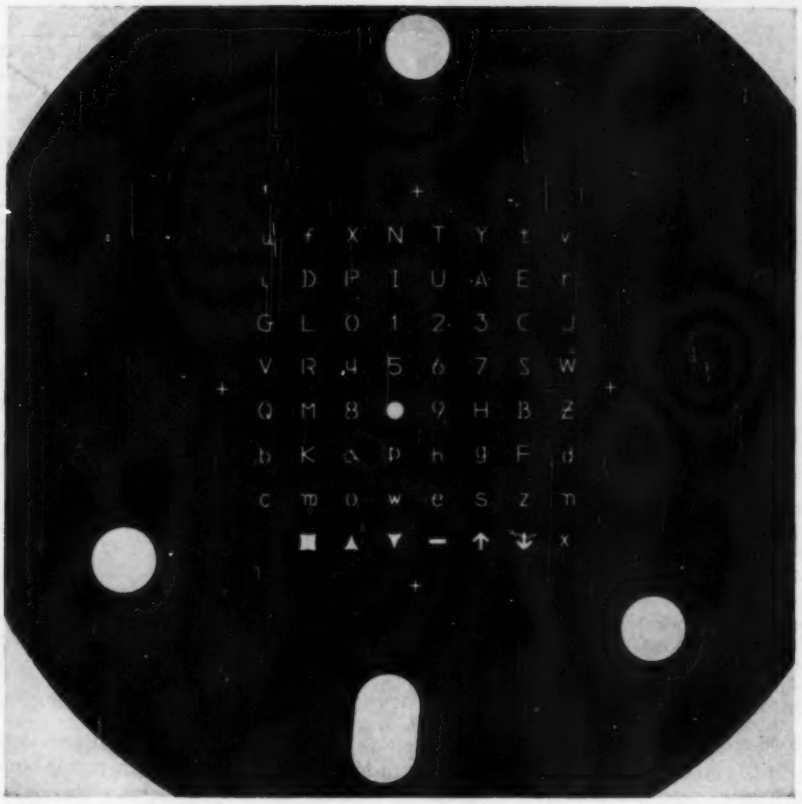
Write **Department A** for Bulletin "CINCINNATI RIGID SHAPERS". We also suggest you consult our Application Engineering Department on your machining problems.

Photo courtesy National Electric Welding Machines Co., Bay City, Michigan

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U. S. A. SHAPERS · SHEARS · PRESS BRAKES



Typical Typotron matrix serves as an "electronic stencil" to "print" more than 25,000 characters per second on screen of tube. Magnified here ten diameters, matrix consists of beryllium copper core faced with nickel. Latter solved problem of rounded edges on characters. After removing photoresist, part is etched as the anode in copper sulphate until all of the figures are light transmitting. Etching includes blanking of circle, except at three points of holding

Electroforming... thin films to close tolerances

ROBERT W HAMPSON

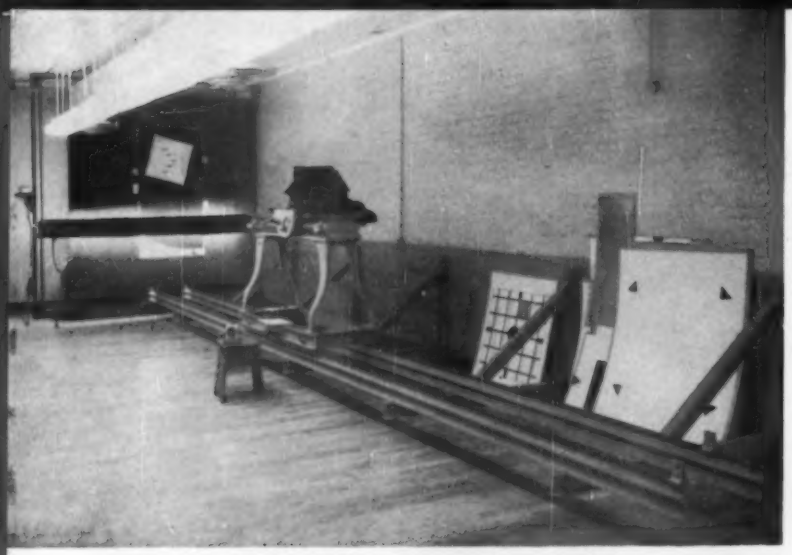
A pattern of digits and letters only 0.012 in. high is produced in nickel 0.0001 in. thick by the Industrial Division of W & L E Gurley, Troy, New York manufacturer of binary code disks and other optical-electronic components. Characters are electroformed in the matrix by nickel plating on a beryllium-copper base only 0.0015 in. thick. These matrices, placed in the electron guns of Typotron tubes, permit display of letters, numbers, and other characters on the tube face at the rate of 25,000 per second. Now we can tell you how the matrices are made

American Machinist

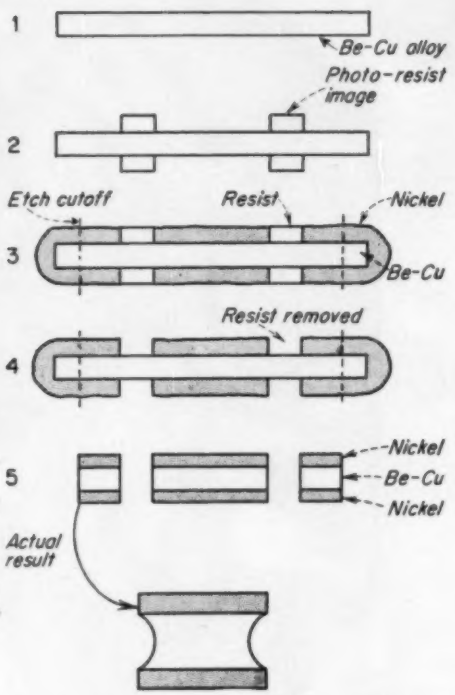
Gurley's custom reticle department does many jobs requiring unusual manufacturing approaches. Three of the most versatile and interesting processes involve electroforming, electroetching, or a combination of both as determined by the function of the finished product. Before going into these techniques it probably would be wise to describe the principal nomenclature:

Reticles are images such as scales and crosslines which are placed in the field of an optical system. At Gurley, the term also includes patterns used in a photoelectric device to regulate the amount and the frequency of light falling on photocells and patterns used to meter the flow of electrons in devices such as cathode-ray tubes; hence produce varying electrical signals. The pattern is produced on glass or on metal by photography, by ruling, or by engraving.

Photographic patterns usually are produced from large, precise drawings made in a specially equipped drafting department. Drawings are done in flat-black ink on flat-white, dense paper, similar to vellum or Stabiline, which is cemented to a metal sheet. Usually, an enlarged image of the desired reticle pattern has the same values of black and white as the finished pattern. The



Camera setup for photo masters, usually gelatin on glass, has camera rigidly mounted on carriage of lathe to simplify adjustment. Lathe, in turn, is mounted on tracks fastened to wall to minimize vibration. Original drawings, sometimes scaled up as much as 1000 times, are mounted on vertical easel and floodlighted



Fine detail requires a special technique using beryllium copper foil as a base and applying 0.0001 in. of nickel to each side. Thus, the nickel provides a sharp image where the original, plain BeCu developed rounded corners

original drawing may be 1000 times the size of the finished reticle pattern.

With the precise master drawing complete, and the edges sharply defined, it is placed on a vertical copyboard, floodlighted and photographed.

The resulting gelatin negative, usually a high resolution photo-glass plate, is placed in a metal jig along with a glass or metal blank, previously coated with a photo-sensitive resist, to position both for accurate contact printing. Next, the assembly is exposed for the proper length of time to sunlight or a collimated 1000-watt mercury arclamp of small dimensions. Photo-sensitive gelatin, glue, other colloids, and plastics can be used as "resists."

It is frequently desirable to use a glue-silver glass negative because of its durability. Glue-silver coatings are photo-sensitive, have insignificant grain size, and permit entirely clear areas—with opacity approaching 100%. In other words, the image possesses infinite contrast photographically.

Gelatin negatives may be used to make gelatin diapositives which can be preserved as masters (because they are easily damaged in handling) and, in turn, glue-silver negatives can be made from the masters. Every step in the process requires the utmost precision to avoid distortion of the image sizes.

A matrix is a form of reticle or pattern having an infinite contrast image *in metal* formed by stenciled apertures through the metal.

Following this stage of processing, electroforming, electroetching, or a combination of both may be necessary to finish the reticle.

ELECTROFORMED CODEWHEELS

The code pattern or codewheel is a special form of intricate precise pattern perfected by Gurley. Among other applications, it is used in analog-digital converters. The code pattern may be used magnetically or optically, (or with both media in combination) and may also be produced on metal bonded to glass for electrical transmission. Normally, the pattern is placed on a glass disk having carefully controlled dimensional and surface characteristics. The blank is silvered, coated with a photo-sensitive material, and processed for a photo-resist image.

Then the silver unprotected by the resist is removed by chemical etching. After removing the resist from the desired silver pattern, copper, nickel, or nickel followed by rhodium are plated as required. By this technique, the codewheel may be made both reflecting and light-transmitting, or reflecting, transmitting, and magnetic.

If the codewheel is to be used only magnetically the nickel is electroformed about the resist image. As the silver is not etched image-wise, the entire surface of the base is conductive. This does not create harmful eddy currents, and the code-wheel functions satisfactorily in an electro-magnetic field.

If a light source is placed on one side of a codewheel and the light-sensitive pickup is located on the opposite side of the wheel, the clear glass areas of the code pattern will transmit light. Reflecting areas will prevent light from reaching the pickup head—hence those areas act opaque. When both sensing unit and light source are on the same side of the codewheel, the clear-glass areas will act opaque because most of the light incident to these areas will pass through the glass.

Thus, the "yes"—"no" information transmission is reversed when going from one system to the other, which results in an angular displacement of 180 degrees. It is not customary to use both systems on the same codewheel.

For most of these code patterns on glass, the electroformed layer can be less than 0.0005 in. thick, as this is adequate for proper operation. If the base

Codewheel techniques

TYPE	Final image composition	Processing						
		Master drawing	Photographic dividing engine master	Glue-silver negative	Photo-resist image	Electro-plated image	Etched image-bare metal	Plating remaining image
Magnetic only	Silver Copper Nickle Rhodium	yes	yes	yes	yes	yes	no	no
Electrical contact, optical transmission, and magnetic	Silver Copper Nickle Rhodium	yes	yes	yes	yes	no	yes	yes
Reflecting and optical transmission	Silver	yes	yes	yes	yes	no	yes	no
Optical transmission only	Glue-silver	yes	yes	yes	no	no	no	no

is a metal such as brass, the electroformed layer can be as much as 0.005 in. thick.

Retention of detail and sharpness of very fine lines starts to fall off in electroforming above a thickness of 0.0003 in. A good criterion is a height not more than one-half the width, to retain sharpness. This phase of electroforming can also be applied to printed electronic circuits other than codes.

OTHER ELECTROFORMED IMAGES

Applying the electroformed metal flush with the base is a technique used to produce some reticles, but it is still in the pilot stage of development:

1. The base is made conductive by depositing metal on its surface.
2. After developing the metal image, the base, if it is glass, is etched with hydrofluoric acid.
3. All remaining metal is now stripped, and the reticle surface is again made conductive with silver or other metal.
4. The reticle is plated with copper until the etched voids in the base are slightly above the base surface.
5. The copper surface is ground and polished until the reticle pattern shows clean against the metal-free non-conducting base.
6. The main copper pattern left in the base is from 0.0005 in. to 0.002 in. thick.

ELECTROETCHING

The conventional method for producing a metal mask of adequate thickness is to etch the image into thin metal sheets by electrical or chemical means. However, this process is not compatible with fine, detailed images. It will round off the corners of small figures which should be sharply defined.

By detailed images, we mean figures of 0.008 in. height by 0.002 in. width. (This is by no means the limiting size of detail that can be reproduced by the bi-metal electroforming-electroetching process for making matrices.) In actual practice, matrix figures 0.004 in. by 0.001 in. have been satisfactorily produced. Although thicknesses of the basic metal have varied from 0.001 in. to 0.012 in., throughout this discussion the thickness of the basic metal will be 0.002 in. as this is mechanically and electrically adequate for most applications.

PROCESS FOR MAKING FINE PATTERNS

While many metals and alloys can be used, Gurley uses rolled half-hard beryllium copper for making Typotron matrices. The copper is cut into small squares, cleaned with chloroform, ethyl oxide and hot water; then it is dipped in dilute nitric acid, sodium cyanide, and hydrochloric acid. It is washed between dips and is thoroughly cleaned at the end of the processing.

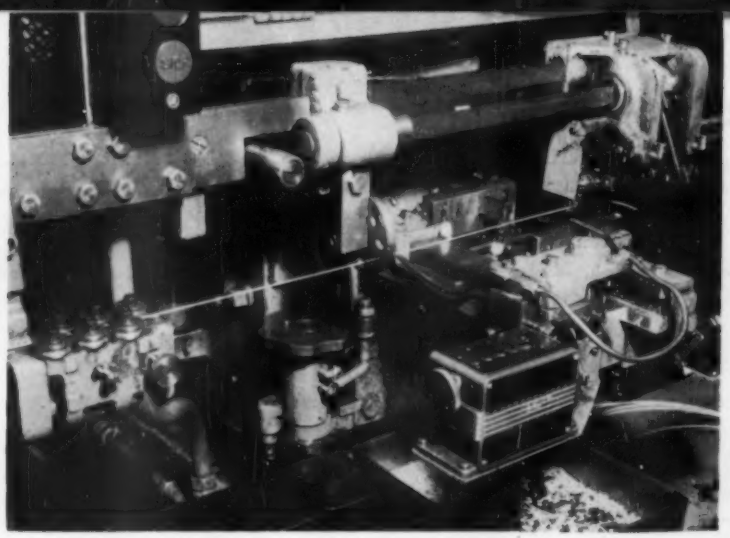
After being coated with a plastic resist solution by dipping or spinning, the metal sheet is placed between two precise glass negatives containing the desired reduced information. These negatives are precisely registered with each other by a holding fixture and the work is exposed on alternate sides to a mercury-arc lamp.

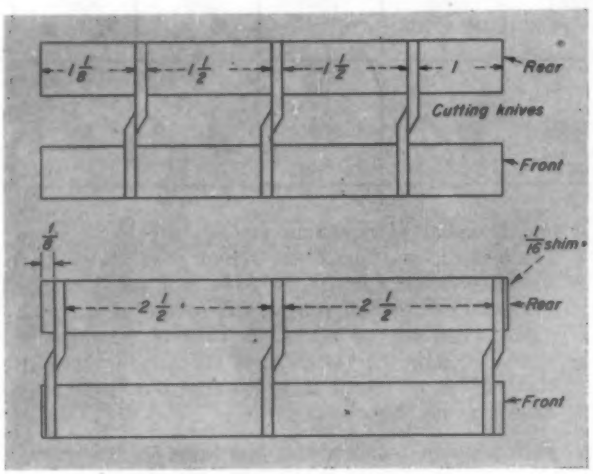
Exposed work is developed in five separate baths containing organic solvents. The last bath is free of dissolved resist, leaving the bare metal very clean.

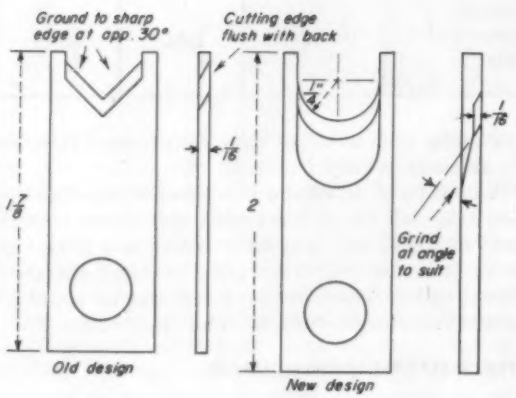
Next, the piece is nickel-plated at a temperature of 70 to 90 F in a mildly agitated solution of $NiSO_4$ and NH_4Cl. After plating, the matrix is swabbed with chlorofom to remove the plastic image.

The nickel-plated matrix serves as the anode in a bath of 20% copper sulfate. It is electrically etched for about one minute at 4 to 6 volts, with the nickel plate acting as a resist to protect the underlying metal. The resulting pattern is etched cleanly and precisely entirely through the metal.

talented tooling





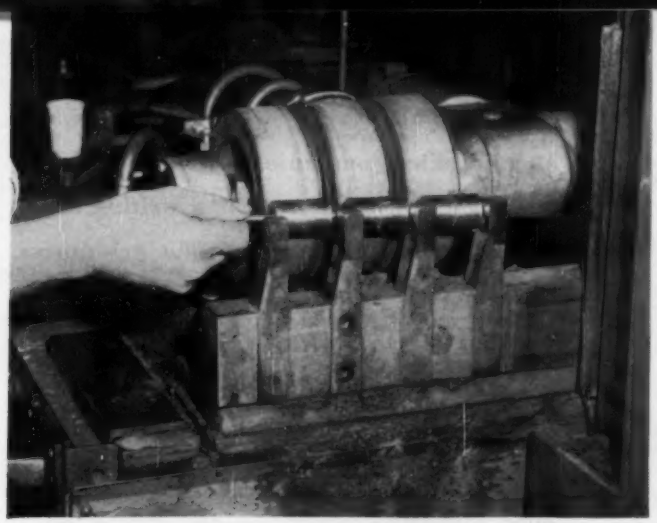


Improvements on Artos wire cutter . . .

include (1) new blade holders that can be inserted in machine to make up to three simultaneous cuts with blades spaced various distances apart, (2) new blade design with round, not V-notched, contour that works better with the waxed, rubber-insulated wire, and (3) nylon wire grippers that hold securely when wire stops, but do not strip off insulation as wire feeds, which older metal grippers sometimes did. *Friden Calculating Machine Co, San Leandro, Calif*

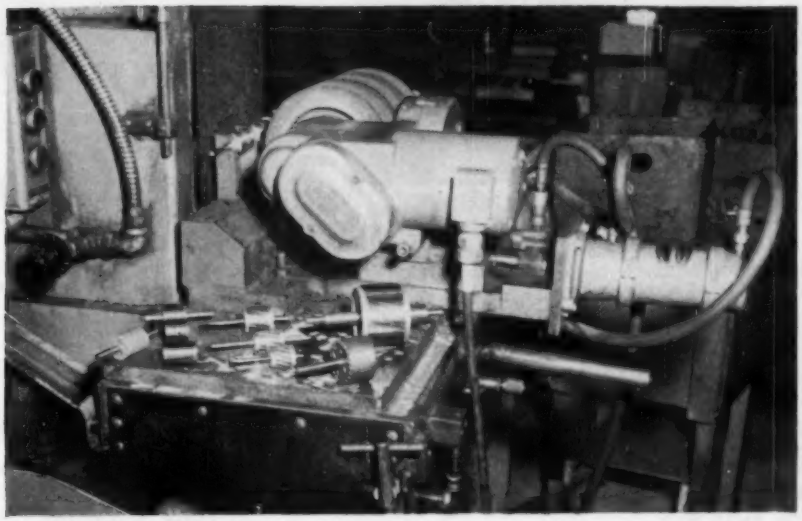
Local tin plating improves bearing fit . . .

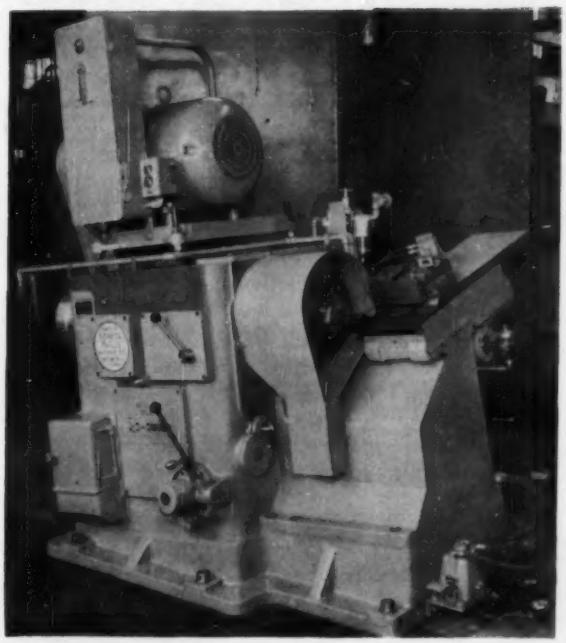
by depositing 0.0002-0.0005 in. of soft metal on bearing ring so press-fitting the bearing in place will squeeze the tin to fill space uniformly between the parts. Unit works on 12 volts, takes 2 to 3 min, and deposits metal of high density and without pinholes. Cathode is connected to lathe, and anode is stylus wrapped with cotton and dipped in plating solution. Swab is held against bearing surface as part rotates slowly. *Dalic Metachemical Ltd, Toronto, Canada*



Belt grinder finishes small rotors . . .

four to five times faster than conventional grinder. Setup is on modified Engelberg machine with special cylindrical fixture. Rubber wheels rotate at 12 rpm to regulate rotors (left), which are assembled on slip-fit arbors that nest in carbide-faced V-blocks. Two-speed hydraulic in-feed brings rotors to belt (below), and reciprocating air feed oscillates fixture across belt width. Rotors are ground to 0.0001-in. concentricity and 0.0005-in. diameter tolerances. Equipment takes half the floor space and costs about 40% as much as hard-wheel equipment, and can be adapted for flat-surfacing work by removing fixture. *Olsen Machine & Tool Co, N Abington, Mass*





Tilted lathe baseplate keeps work in chuck . . .

when cast-iron pipe flanges are positioned by endwise locator. Seneca Falls model AR is at 9° to floor, which prevents work from falling out before clamping and after unclamping; also allows operator to get closer to work. Relieved toolblock faces flanges to desired rough finish. Operation is faster than originally hoped, so only three instead of ten lathes are used. *Grinnell Co, Providence, RI*

Metalworking companies find that job evaluation is a thorny matter when writing labor contracts, and also later when grievances arise about changed or new jobs. We are privileged to publish correspondence between a nationally known arbitrator of labor-management industrial disputes and a management consultant with much experience with the

ground rules for *SUCCESSFUL* job evaluation

ELMER E HILPERT,
professor of law, Washington University
member, National Academy of Arbitrators

WHAT ARE THE RULES?

March 22, 1957

Prof Michael J Massimo
Massimo & Sanders, Inc
500 Fifth Ave
New York 36, N Y

Dear Prof Massimo,

In accordance with our conversation, please ask your associate, George E Sanders, to give me:

A concise statement of the fundamental principles underlying job-evaluation programs in industrial plants and a brief but concrete description of the basic technique of *successful* job evaluation.

It may be helpful to Mr Sanders to tell you why I have turned to your firm for help:

For the past 18 years I have acted as arbitrator in numerous labor-management disputes. Of late, as job-evaluation plans have become more common, a number of disputes have involved the "rating," or evaluation, of so-called "new" or "changed" jobs within an established job-evaluation plan. I have encountered none of the difficulties in decision, related below, in instances where the initial job-evaluation program has been installed by your firm. This circumstance leads me to believe that you can contribute to an understanding of job evaluation something that I have been unable to convey by referring people to "literature" on the subject.

As an arbitrator, I have encountered a variety of job evaluation plans. Most of them, while "home made," have rather obviously not been "tailored" to fit the particular plant. Many of them seem to have resulted from a superficial application of some "manual." When the chips are down, few, if any, of these homemade plans furnish an arbitrator with reliable guides for decision.

It seems to me that job-evaluation plans that are least satisfactory to the parties and to the arbitrator are those that breed needless resort to arbitration. Settlement of disputed evaluations of "new" and "changed" jobs apparently cannot be achieved by reference to the technique used in the initial evaluation of then existing jobs.

The situation leads me to believe that there must have been a failure to grasp the real import of job evaluation when these plans were initially formulated and installed.

Currently, there is a great deal of discussion of the problem of job evaluation in industrial plants. Companies and unions that have had job-evaluation plans, but dispensed with them by mutual agreement, are again encountering the difficulties that come from bargaining about rates for specific jobs or mere job titles. However, they remain skeptical about job-evaluation plans. Nevertheless, a number of my acquaintances among company personnel men and union representatives are sufficiently interested in a new approach to job evaluation to have me make this inquiry of you.

Very truly yours,

Elmer E Hilpert

GEORGE E SANDERS,
president, Massimo & Sanders, Inc, N Y
Management Consultants

WHAT WE SUGGEST

March 28, 1957

Dr Elmer E Hilpert
Washington University
St Louis, Mo

Dear Dr Hilpert,

Prof Massimo has relayed to me your request for comment on how a job-evaluation program should be set up. For the purpose of discussion, it is necessary to presume a fairly complete knowledge of the mechanics of job evaluation.

The prime purpose of a job-evaluation program is to establish an acceptable set of reasons for the differentials in rates of pay associated with jobs which have different total contents.

It is not an exact science. It can better be described as an empiric system for relating one job value to another, and for justifying to management and union, the rate of pay established for each job.

MEASURE OF RELATIVE WORTH

It is important to emphasize that job evaluation can only set the relative value of one job to another. The range of values of a total group of jobs can only be established through collective bargaining. A clear understanding of the fact that job evaluation can only be used as a measure of the relative worth of various jobs, one to another, is necessary before any job-evaluation program can satisfy the requirement of being acceptable to the employee group upon which it is imposed.

FRAMEWORK

A job-evaluation program is only a part of the total labor-relations program. Its administration must, therefore, conform to the basic labor-management policy existing between the parties. It can be executed and administered unilaterally, provided that there is at least a knowledge and understanding of the procedures on the part of the employee group. It can be set up to be administered unilaterally with policing by the union. It can also be set up to be executed and administered jointly by management and union. In a few cases, a job-evaluation program has been worked out by a union's engineering staff, and subsequently administered jointly by management and union, but the latter arrangement is reflective of an unusual labor-management relationship.

Regardless of the administrative framework within which the job-evaluation program is set up, it must contain two basic ingredients; i.e., identification and evaluation.

IDENTIFICATION

Identification is accomplished through the job description. This description should establish the scope of the job to be measured. Its function in the program is one of identification only. It should not properly contain adjectives such as "easy," "difficult," "unpleasant," "careful," or other adjectives which imply content value. There are enough problems of identification to complicate writing a job description without trying to make the description serve as a partial evaluation as well.

Care must be exercised that the scope of a given job be narrow enough so that a reasonable identification can be made of the frequency with which principal assignments of work are performed by the employee working under the job title. The job description must also be broad enough so that it encompasses all the duties normally assigned to an individual during an identifiable period of time. Unless the recurrent duties of an employee are completely covered by the job description, it does not satisfy the condition that it identifies the job in question.

A complete and legally airtight job description that describes every act and duty of an employee on a given job is an impossibility. It is, therefore, necessary that both parties understand that a statement of identification of a work assignment includes all the detailed description inherent in the performance of that assignment. If, for example, a lathe operator's job includes the statement "change chucks, as required," it is superfluous to include "loosen chuck on spindle thread; back chuck off spindle part way; sling chuck; back chuck off spindle complete; remove chuck to storage rack; return to lathe with alternate chuck; etc, etc."

The identification of the scope of the job must be realistic. The operations which are performed must be identified, but they must not be evaluated in the description. Job-content changes must be kept cur-

Ground rules for *SUCCESSFUL* job evaluation . . .

rent, and no substantial deviation from the described job must be permitted in the actual performance of the job without a corresponding change in the description. It is, therefore, imperative that all interested parties, including affected workers and supervisors, be kept advised of the scope of work contained in each job description.

EVALUATION

The second ingredient of a job-evaluation program is the establishment of the relative values of the various identified jobs. Stripped of all its mechanical trappings, this phase of the program establishes that Job A has greater intrinsic value than Job B, which, in turn, is more valuable than Job C, etc.

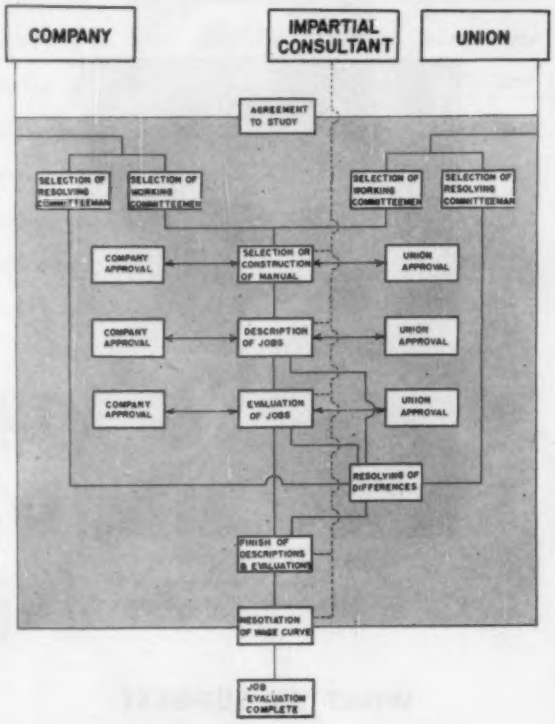
The process of evaluation is basically one of ranking. In the grossest sort of evaluation, a series of, say, ten jobs are first arranged in ascending or descending order of value in the judgment of the evaluator. After this has been done, the ladder of jobs is reviewed, and such jobs as appear to be almost equal to adjacent jobs are grouped together. After this grouping has been done, the evaluation is satisfied if jobs which fall at the bottom of the ladder are paid least; those on the next level are paid more; and so on up the ladder.

This gross process is sufficient where only a few jobs exist, and where the difference in job values is obvious. For example, in a plant which employs only laborers, cranemen, and machinists, the problem is so simple that a formal evaluation is unnecessary.

As the problem becomes more complex, it becomes increasingly difficult to construct the ladder of comparison. In practice, it is necessary to confine one's thinking to only one aspect of all jobs at one time. It is, therefore, necessary to use factors. When only one factor of a job's content is considered, it then becomes possible to compare large groups of similar and dissimilar jobs, and arrive at a ladder of ranking for one factor alone.

In terms of a single factor, this ranking can be treated like the gross ranking above. However, ranking ladders based on factors cannot be converted into a job evaluation without establishing some relationship of values between the factors. Unfortunately, there is no single answer as to the relative value of "skill" for example, in comparison to "working conditions."

There are as many different relative factor values as there are published manuals. No one manual is correct, to the exclusion of all others. The NMTA and CWS manuals* are two that have wide ac-



Flow chart . . .
of a typical jointly developed job evaluation program

Job evaluation in action . . .
at Niedringhaus Metal Products Co, St Louis, manufacturers of hollow metal doors. Reading clockwise—J Huber and E Lockmoeller for the company, Prof M J Massimo, a principal of Massimo & Sanders, Inc, and S Legamaro and J Pingel for the union

*NMTA manual published for members by the National Metal Trades Association, 337 W Madison, Chicago 6, Illinois.

CWS manual, entitled "Job Description and Classification Manual for Hourly-Rated Production, Maintenance and non-Confidential Clerical Jobs," published Jan 1953. Available from Industrial Relations Dept, U S Steel Corp, 525 William Penn Way, Pittsburgh, Pa. Price, $10.30 with tax.

ceptance in metal-fabricating plants. Each assigns different values to various sub-factors yet both yield more or less acceptable answers to the problem of job evaluation.

From the above it can be seen that the ranking of jobs in any one factor can be done fairly easily by the application of good judgment, but relating of factor values, in other words, the establishment of point values for the steps on the various factor ladders, can only be done by trial and error, and by negotiation based upon knowledge of the subject. The selection of one of the accepted sets of factor point values, or the construction of a new point-value scale, must be made with the realization that the point scale selected is merely an acceptable solution to a problem for which the right answer is, as yet, unknown. Calibration of each factor ranking is arbitrary, regardless of whether it is done unilaterally or jointly by management and union.

Each of the published systems in current use was developed by selecting a group of factors, ranking the factors for a set of known jobs, and calibrating the resultant rankings in such a way as to yield logical correlation between the total job point values and the accepted gross relative values of the jobs in question.

As a result of the availability of this published information, the belief has grown up that a manual of point values can be used to evaluate a single job. In other words, a given job can be compared with the word description of each factor-level definition and can thus be evaluated.

The statements describing each factor level are, of necessity, sometimes vague and ambiguous. In many instances, the wording was intended to be understood in the light of a given set of conditions. At a later date, this wording is then interpreted against a completely different set of circumstances. The result is confusion, honest difference of opinion, semantic manipulation to serve a given end, etc.

The theory of evaluation has been discussed at some length because without an understanding of the tools of evaluation and their historical development, endless bickering results from each attempt to assign a given number of points to a given factor of a particular job. To attempt to classify job contents in factor levels by comparison with the descriptive material in a job evaluation manual is a difficult job even for an expert.

SUGGESTED EVALUATION PROCEDURE

As a practical solution to the problem of evaluation of a group of jobs, the following steps should be taken.

1. A set of factors must be selected, preferably following one of the accepted evaluation manuals.
2. Ladders of ranking of all jobs must be constructed, one for each factor, without reference to the described levels of the factors.
3. Steps one and two above can be performed unilaterally or jointly, in accordance with the collective bargaining agreement.
4. Only after these rankings are completed should they be calibrated with the point values from the manual selected in step one. This calibration must be done by an expert disinterested party.
5. After calibration, the point value for each job is established automatically from the results of the calibration of the various factor rankings.

After initial installation of a job evaluation program, new or changed jobs need not be evaluated in terms of the words in a manual. Instead, reference is made to the uncalibrated ranking list of each factor in turn. The job in question can then be placed in its proper relative ranking position by the exercise of reasonably good judgment in comparing the new job to similar jobs whose position in the ranking has been established. After this ranking process has been applied to each factor, the point value of the new job can be established merely by applying the calibration to the ranking list.

The advantage of this method over the factor-level description method cannot be overemphasized, because it has been found to be the key to the avoidance of haggling and hair-splitting in the evaluation of minor job-content changes.

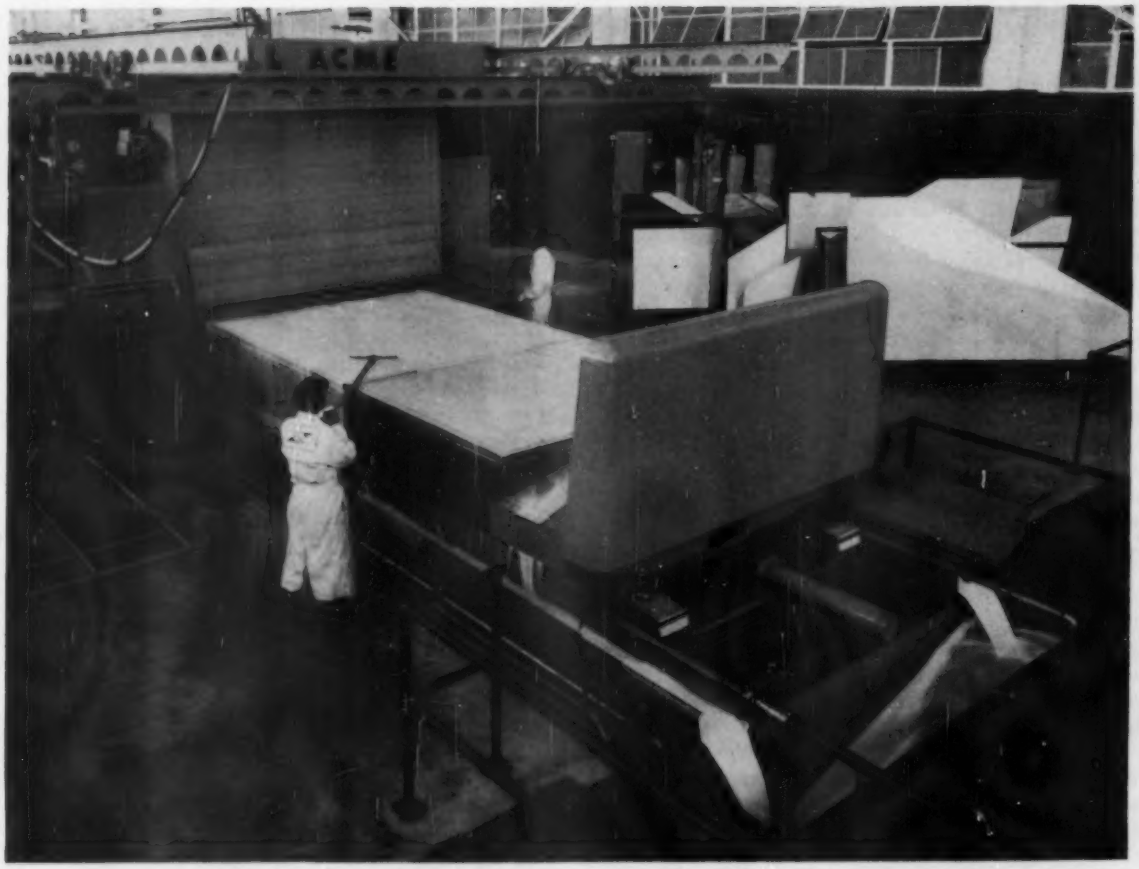
SUMMARY

1. The job-evaluation program can be executed and administered unilaterally or jointly. The greater the participation of all interested parties, the more the program will provide an acceptable basis for wage differences between jobs.
2. The job description must identify the job in question—it must not try to evaluate it.
3. The evaluation phase of the program must consist of a series of factor comparisons, job to job, not a comparison of a job factor to a phrase in a manual.
4. Job-factor comparisons can be calibrated and converted into point values by an evaluation manual, unilaterally or jointly selected in accordance with the collective bargaining agreement, only after the job-to-job comparisons have been made.

Application of the above principles to a job evaluation program executed by personnel who have a knowledge of evaluation procedures should result in a relatively successful program.

Any job-evaluation program can only be successful if the collective-bargaining supplemental agreement under which it is installed and administered is well thought out. A discussion of the various considerations in such an agreement cannot be undertaken without a detailed knowledge of the labor-relations background of the parties. Such a discussion must, therefore, only be undertaken in the light of a specific situation.

Very sincerely yours,
George E Sanders
MASSIMO & SANDERS, INC



Hill-Acme grinder was built to Bell Aircraft specifications and installed to finish flat and tapered wing skins for aircraft. After 2½ years of operation, including many experimental jobs, here is a . . .

PROGRESS REPORT ON

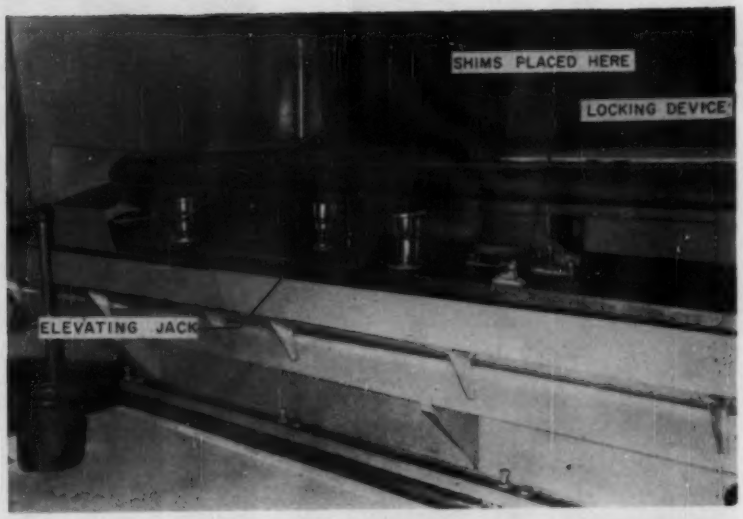
Tapered-skin belt grinder

JOSEPH R BURNS, supervisor: mfg research & development, BELL AIRCRAFT CORP

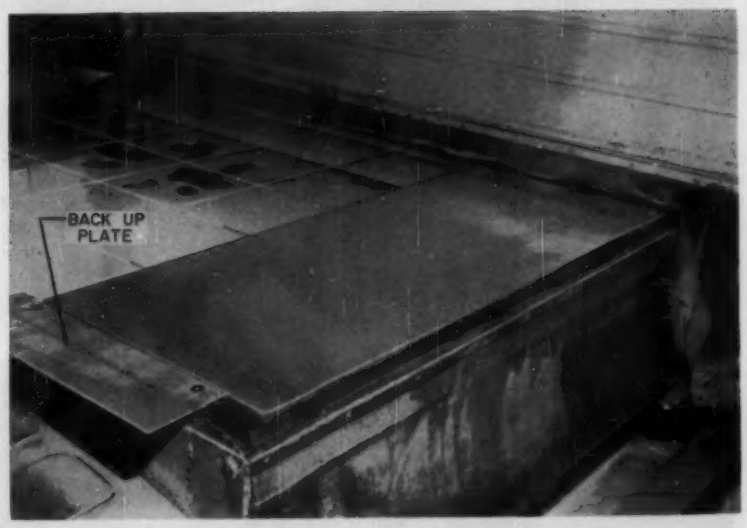
Results since this machine was first reported (*AM*—Nov 22 '54, p 126) have been good. It will grind many materials, including magnesium and glass; it removes aluminum at the rate of 14 cu in. per min; and it has cut machining cycle times as much as 50% under conventional methods. Here, in text and illustrations, are selected examples of the kind of jobs it handles

The main purpose of this 250-hp machine is to finish large surfaces flat within close limits. For example, it can grind aluminum at the rate of 14 cu in. per min, using a 36-grit belt and coolant, to produce a finish accurate within 0.002 in. With a finer belt —80 grit—and slower feed—0.003 in. per pass—it will finish a surface accurate to 0.001 in.

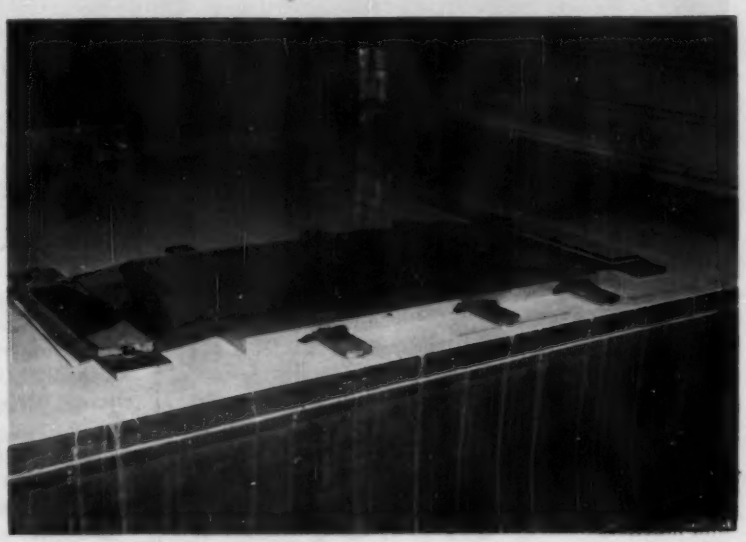
The machine has several features that help accuracy and speed. Table power is through opposed hydraulic cylinders that operate evenly at any speed. Coolant applied to the belt and to the point where the belt touches the work is filtered to improve belt life, work finish, and machine efficiency. In emergencies a vacuum switch stops and reverses belt



Machine table is tilted by jacks and shims under one edge. Simple or compound taper can be set up. Top face of 192 x 84-in. table is a vacuum chuck with evenly spaced openings. Unused areas are sealed off by plugs

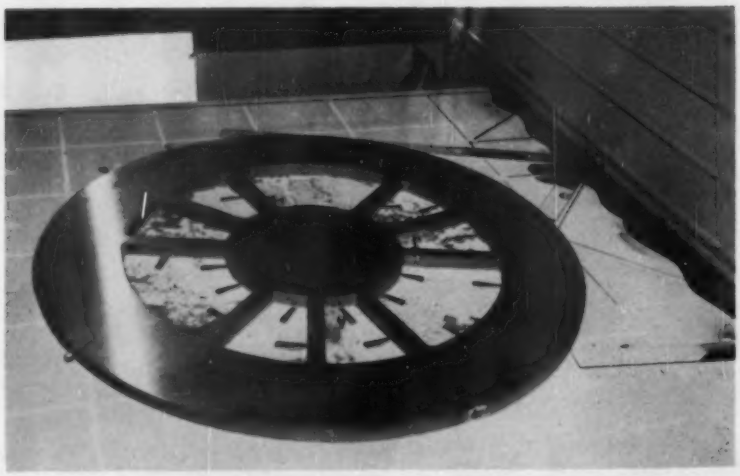


Aluminum skins were tapered from 0.150 in. at one edge to 0.051 in. at the other. Belts were 26 in. wide and backed with waterproof cloth. Roughing was done with 60-grit belt; finishing with 150-grit. Coolant was 80:1 emulsified oil



Stretch fixture gripped thin 7075 ST-6 aluminum sheet over flat-ground aluminum plate. If chucked directly on table, thin stock would distort over vacuum openings. Taper of 0.0006 in./ft was produced

Stainless steel was belt-ground on a stretch fixture to produce special scratch finish. Stock was 0.035 in. thick, and was machined without coolant—but brushed with oil before each pass. Roughing was done with 120-grit belt; finishing with 150-grit



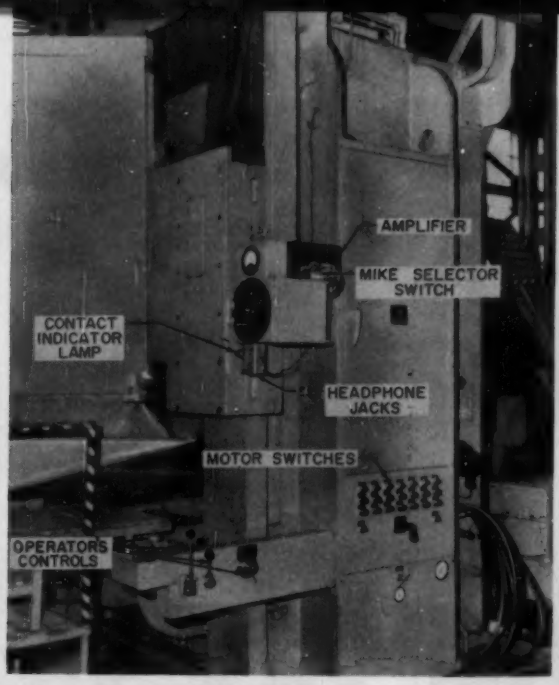
Boiler-plate parts were ground flat and parallel on opposite faces with aluminum-oxide belts, saving time and costs. These and other fixture components were flame-cut. Flat grinding has also salvaged cast-steel foundry plates used for making Kirksite dies

Optical-glass plates were refinished on improvised wooden fixture, saving about 93% in time over conventional glass-grinding methods. Silicon-carbide 36-grit belt was flooded with coolant, and cuts as deep as 0.250 in. were taken without damaging the glass. Table speed was 13 ipm

downfeed if the vacuum holding the work to the table is broken.

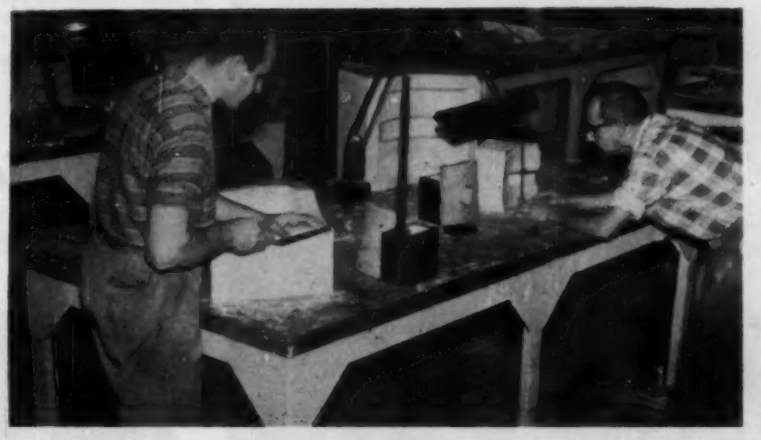
Much of the work done in the last 2½ years on the machine was with aluminum, but magnesium has also been ground safely. Sheets 18 x 168 in. have been tapered from 0.125 in. at one edge to 0.040 in. at the other. Roughing was done with 60-grit belts, and finishing with 240-grit. In all cases, magnesium requires finer belts to end up with the same surface finish that may be produced on aluminum with coarser belts. Magnesium has been finished to 40-50 mu in., and aluminum to 15 mu in. To avoid fire danger, mineral oil is the coolant on magnesium production runs; but for some test work a heavy flood of water has been applied.

Stainless steel has been surfaced, saving 75% of



Contact detector lights lamp and signals operator via earphones the instant downfeeding belt touches work. Height control must be held within 0.005 in. by 1-hp geared motor acting through magnetic clutch and elevating screws

Sheet handler is operated from same vacuum line as machine. This prevents thin stock from getting out of hand and wrinkling



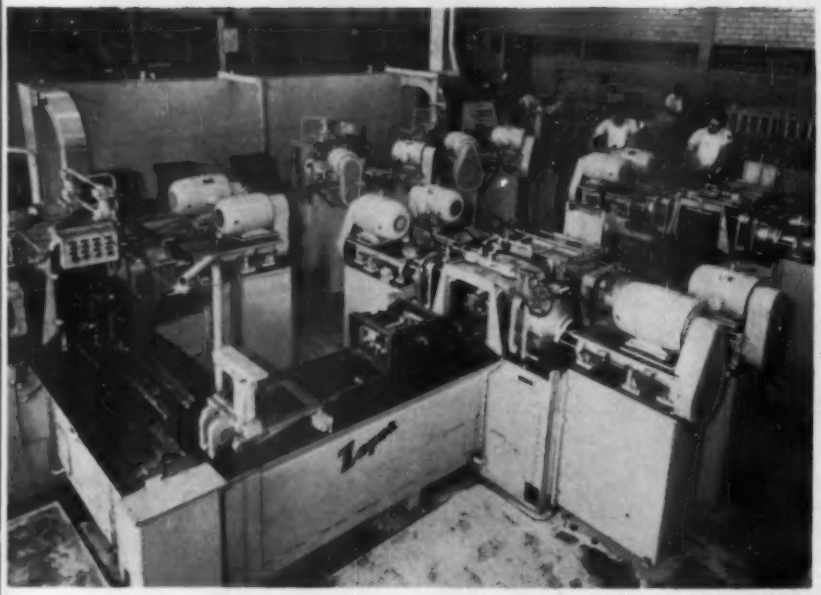
Marble table tops have been refinished by belt grinder, using grits of 36, 120, and 180 in sucession. Cuts were in 0.010-in. increments; table feed was 5 fpm. Last cut with finest belt took off only 0.008 in. of stock in increments of 0.001 in.

the time that would be required for planing the same work. Sixteen sand-cast type-302 fixtures for a heat-treat operation were ground parallel on top and bottom faces. Aluminum-oxide 36-grit belts cut 0.003 to 0.005 in. deep per pass, and table travel was 12 ipm. Finishing to 100 mu in. took a 60-grit belt.

Titanium has also been ground, using a 36-grit belt and coolant. The workpieces were 600 flanged strips, and 0.035 in. was taken off each strip with the work chucked five at a time on the machine table. Each load took 15 minutes. Another resurfacing job was 3000-lb steel foundry plates used for setting up sand molds for Kirksite dies. These were reground top and bottom with a 36-grit belt to compensate for warping. Time required was 4 hr each, which was 6 hr less than other methods.

Both hot-rolled steel and aluminum castings have been ground. One steel plate 10 ft long and 18 in. wide was roughed to remove hard scale with a 36-grit belt, then finished with 60 grit, in 2½ hr. A cast-aluminum tooling plate 36 x 24 x 1.5 in. was finished to 150 mu in. in under 30 min.

Unusual jobs involving both glass and marble have also been tackled, as illustrated. The glass block, which was intended for use as a high-lead-content radiation window, was completed in about 30 min; according to Corning Glass Works representatives, it would have taken 8 hr by conventional means. Marble for plaster-shop tables was resurfaced in the plant instead of sending it out, as before. This saved 50% of the reflinshing expense, and showed that the stone ground easily and wore the belts slowly.



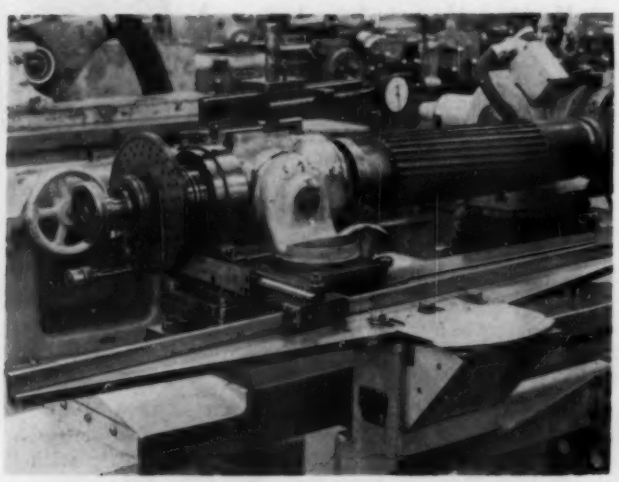
Die-cast power frames . . .
for electric typewriters are surface milled, then loaded into fixtures on Zagar transfer machine where 52 holes are drilled, tapped, or reamed on six sides and two angular faces, two parts at a time. Machine has automatic chip recovery and coolant filtration, handles 125 frames per hr

Memorial plaque . . .
to the late Walter Zagar is unusual feature on transfer machine. This was the first machine of its type produced by Zagar Corp, and Walter Zagar died before it was completed. Plaque also gives names of those who designed and built the machine and who were trained in their crafts by "Pa" Zagar

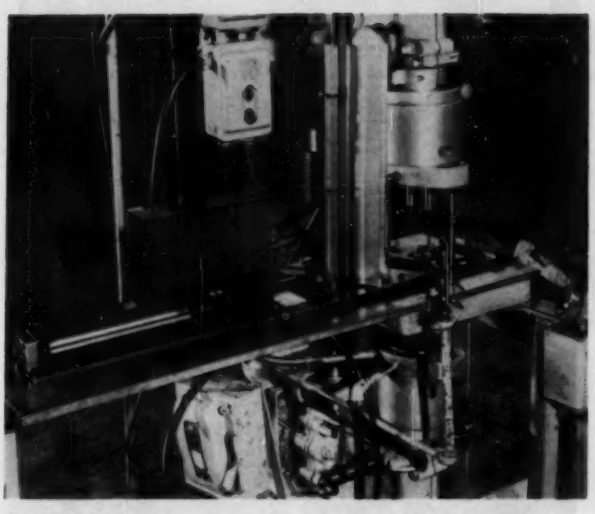
H E LINSLEY,
associate editor

Cost-Cutting Ideas from IBM

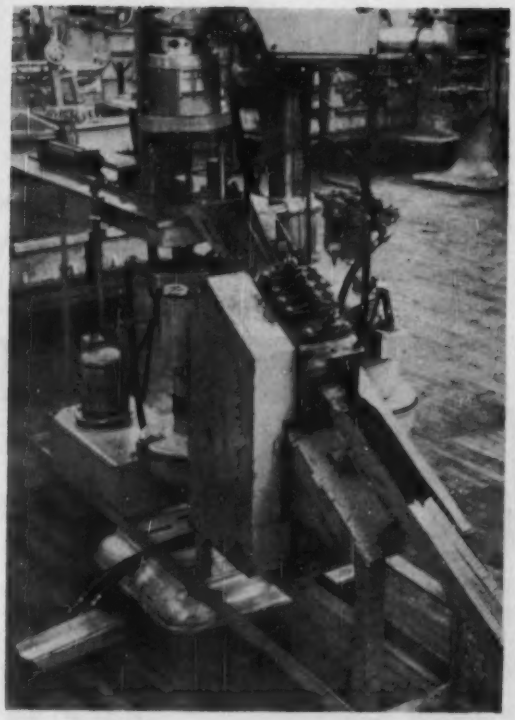
Group of five . . .
Natco multi-spindle drillpresses are connected by rails to enable rolling tables to be positioned under as many as 160 tools to drill and ream holes on four sides of aluminum business-machine castings. Fixtures are indexed in four positions, and fixture beds can be positioned to front or rear of each machine, thus providing ten drilling or reaming stations



Special grinding setup . . .
on Cincinnati cutter grinder for sharpening gang cutters used for milling business-machine racks. Individual cutters are specially designed to meet part specifications and are keyed to arbor with a helical key. Once accurately set in arbor, cutters are not removed until broken or worn out. Index plate (left) controls tooth spacing, sine bar (foreground) is set to conform to cutter helix so each tooth will be ground identically

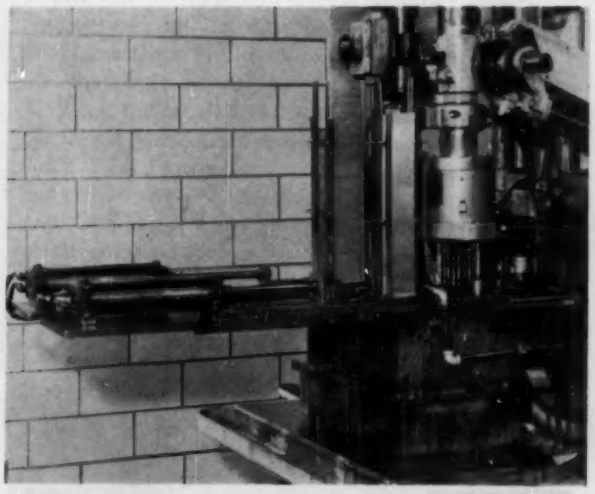


Both sides . . .
of business-machine part are reamed and countersunk in dual-head machine—one head inverted. Parts are stacked automatically at punch-press operation, loaded into magazine, and fed automatically by air feeder at 4000 per hr. Finished parts are ejected into chute, passed through roll straightener, and automatically re-stacked

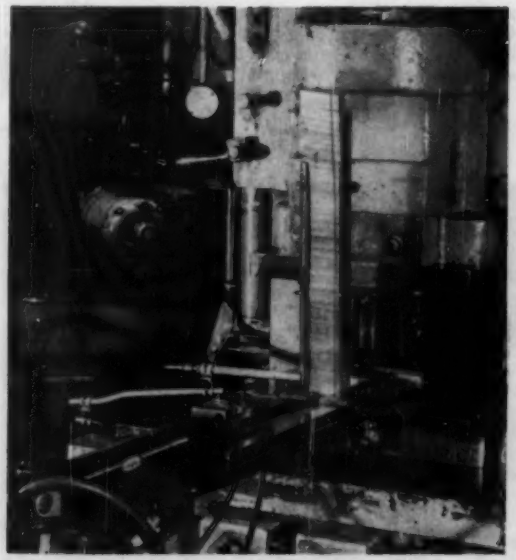


Discharge side . . .
of automatic reaming and countersinking machine shows power-operated roll straightener and stacking chute. Stacking is standard practice, where possible; saves tremendous amount of time when parts are oriented and loaded into subsequent machines

Because IBM products are designed primarily as cost-cutting equipment, it is only natural that IBM process engineers are highly cost conscious. Here are some of the tooling tricks they use in their own plant

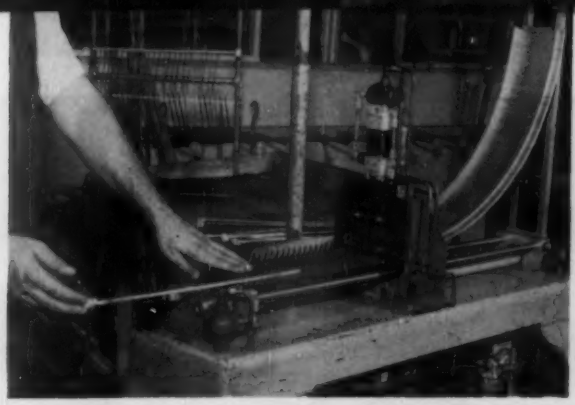


Oriented and stacked . . .
parts are fed automatically to working position on twin, multiple-spindle-head machine, discharged through chute (lower right), and picked up on stacking wires for delivery to next operation

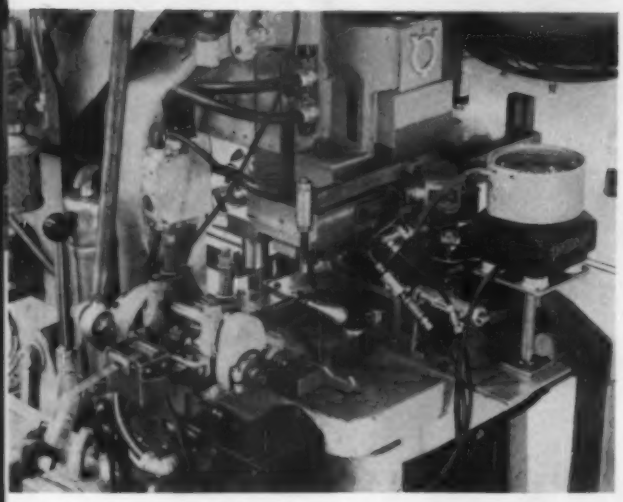


Forming press . . .
receives machined parts from magazine by air-operated loader. Formed parts are ejected automatically, dropped into tote boxes for delivery to assembly

Cost-cutting ideas from IBM . . .

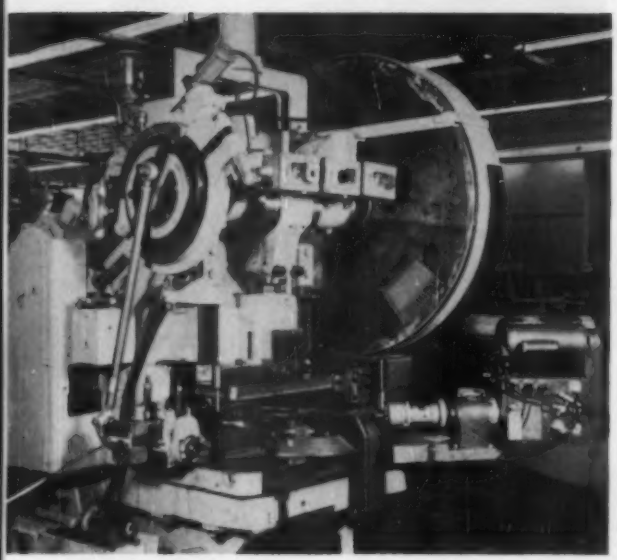


Air-operated "chopper" . . .
automatically spaces key levers from magazine (right) for insertion of holding bar prior to racking on plating frame. By eliminating tedious manual racking of individual parts, production has been increased 75%



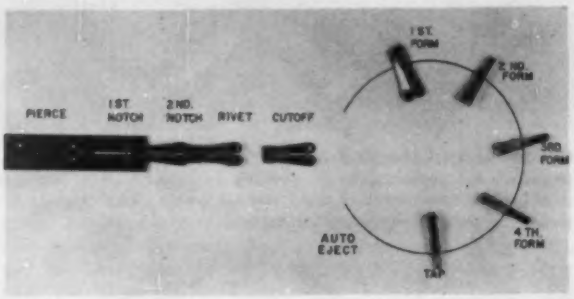
Compound die . . .
eight-station turret, and vibratory feeder are combined to produce 2500 clevis assemblies per hr from coiled stock. Clevis pins are fed from feeder, positioned in nest with clevis blank, and one end spun over before bending and forming operations are performed

Close-up . . .
of eight-station turret on automatic clevis-forming press. Note chute (left) into which assemblies are blown by air jet



Clevis-forming press . . .
with automatic tapping head for tapping shank

Operational sequence . . .
for production of clevis assemblies from strip stock. Process is fully automatic and output is 2500 pieces per hr



Round Table...

Don't Cry on My Shoulder!

"All I ever get from Hunter is complaints, Ed. He was in my office half the morning, bellyaching as usual about how he works so hard and doesn't get recognized."

"Sounds familiar, Al. I've got one or two crybabies, too. The only way to discourage them is to be tough. Tell him to stop wasting your time, and he'll cut it out."

"Well, I hate to insult him, Ed; but that's about the only way to stop his noise. He's a fairly good worker, and I don't relish the thought of training a new man."

"Don't worry about that, Al. These sob sisters have very thick hides. If you only drop a few hints about the work you have to do, they never get the idea. Get rough, Al. It's the only way."

"What gets me is how easy it is for him to just drop in and ruin my whole day. I can't keep him out. There ought to be some way for a foreman to protect himself from that kind of annoyance."

"How can you? A foreman's job is to keep himself available to help his men. It would be like Harrison refusing to see either of us when we have a problem."

"That's different, Ed. Neither one of us makes a practice of crying on his shoulder every chance we get. Usually we have real critical problems when we go to see him. But Hunter's not that kind at all."

"What makes you think it's so different, Al? I'll admit you're not the crybaby type, and I don't think I am either, but Harrison has problems that involve thousands of dollars each day. Our big worries probably seem like very small potatoes to him."

"And you think I should take Hunter's whining seriously?"

"Not necessarily, Al; but you can't cut yourself off from any of your men. Who knows? Somebody might come in with a real problem that requires your decision. Any time a foreman stops talking to his men, he stops being a good foreman."

"I suppose so, but I'd sure like to install a trap door I could use on the constant complainers."

• • •

Should Al try to take this buffeting from a few of his men with more grace, or is he right in resenting the few timewasters? Is there any effective way to discourage the crybaby? Your ideas may help others. Discussions of earlier topics start on page 236.

14 steps TO DESIGN A DIE

STEP 10

How to Design Strippers

Part 2—Knockouts

J R PAQUIN

REPUBLICATION RIGHTS RESERVED BY AUTHOR

Knockouts remove, or strip, completed parts from within die members. They differ from stripper plates (AM—Apr 22 '56 p 140) in that stripper plates remove the material strip from around punches. There are three types of knockouts:

1. POSITIVE KNOCKOUTS. These eject the blank upon contact of the knockout rod with the knockout bar of the press.

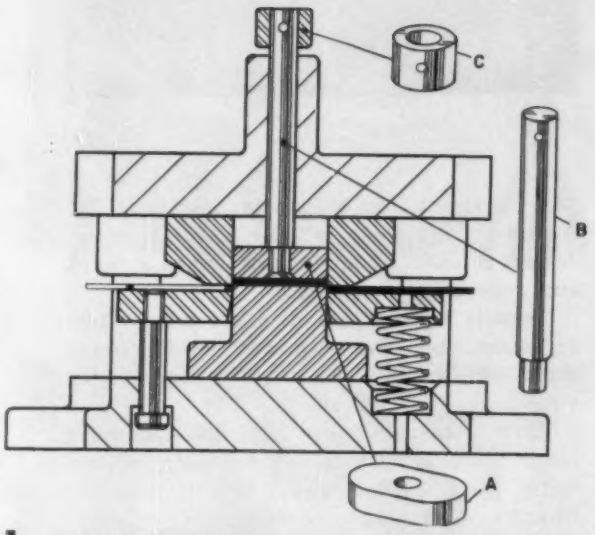
2. PNEUMATIC KNOCKOUTS. These are actuated by an air cushion applied under the bolster plate of the press.

3. SPRING KNOCKOUTS. These use standard die springs as the pressure source.

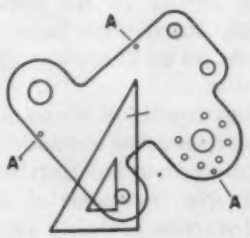
The knockout plate in contact with the part is usually made of machine steel, but would be made of heat-treated tool steel when it also performs a forming operation.

Knockouts can be applied in two ways. In the first, direct knockouts, pressure is applied directly from the source. In the second, indirect knockouts, pressure is applied through pins arranged to clear other die components, such as piercing punches.

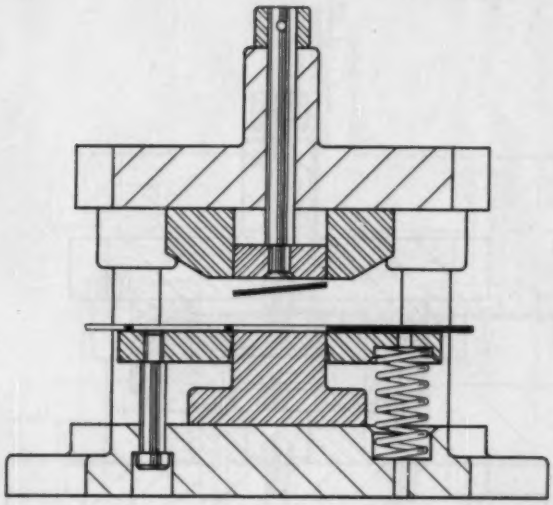
Illustrated are 20 methods of applying knockouts to dies, as well as details of their construction, and methods of finding the center of stripping pressure for correct design.



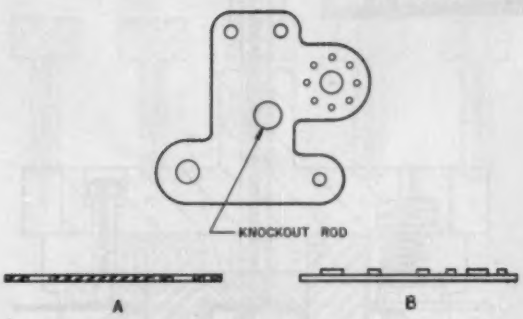
1.. TAKEN TOGETHER, Figs 1 and 2 illustrate the operation of a positive knockout. This is an inverted blanking die, with the blanking punch fastened to the lower die holder of the die set, and the die block fastened to the upper punch holder. The knockout assembly consists of knockout plate *A*, knockout rod *B*, and stop collar *C*. At the bottom of the press stroke the blanking punch has removed the blank from the strip, and inserted it into the die block, raising the knockout assembly



4.. FOR VERY LARGE BLANKS, which would be difficult to balance, pierce three small holes *A* close to the edge of the blank. Suspend the blank from a vertical surface, using a pin or thumbtack. With a triangle draw a vertical line directly under the hole from which the blank is suspended. Turn the blank around and suspending it from one of the other holes draw another vertical line crossing the suspension hole. The intersection of the two lines is the center of stripping pressure. Suspend the blank from the third hole to provide a check for accuracy



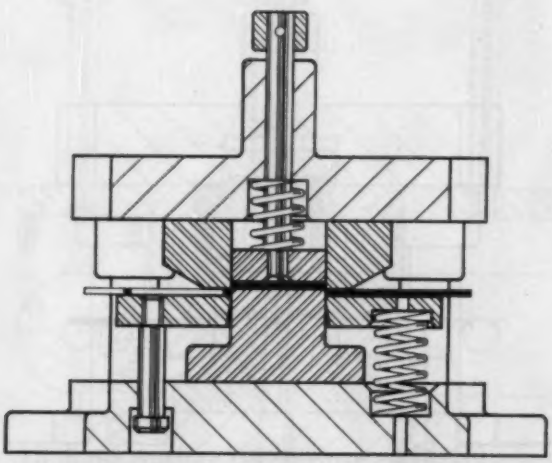
2.. NEAR THE TOP OF THE PRESS STROKE the knockout rod contacts the stationary knockout bar of the press. Continued ascent of the upper die causes the knockout to remove the blank from within the die cavity. If the job is run in an inclined press the blank falls to the rear of the press by gravity. Thin blanks may be blown to the rear of the press by air. Blanks produced from oiled stock tend to cling to the face of the knockout. When this condition is present, shedder pins, applied to one side of the knockout plate, will break the adhesion and free the blank. Three types of shedder pins were illustrated in Fig 15 of Step 3—Blanking Punches, (*AM*—Jan 30 '56 p91)



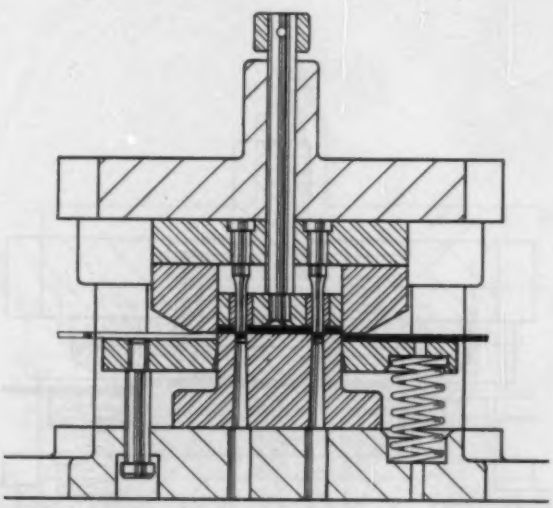
3.. BEFORE DESIGNING the knockout the center of stripping pressure must be found. If the knockout rod is not applied at the exact center of stripping pressure, the rod will be strained and bent in operation. Symmetrical blanks present no difficulty, but when blank outlines are irregular here is the method to use:

Place a sheet of cardboard (board for show cards is best) under the part drawing. Insert carbon paper between the drawing and cardboard and trace the part outline, as well as all holes and openings. With scissors cut out a cardboard blank as shown in the plan view. All holes and openings may be cut out of the blank as shown at *A*. The blank is then balanced over a point, (a pencil will do). The center of balance is the center of stripping pressure.

Cutting out small holes is difficult, so here is an alternate method: From the same weight cardboard cut slugs the shape and size of all holes and openings. Paste these in position on top of the blank as shown at *B*. Balancing the blank as before will establish the center of stripping pressure



5.. IN APPLYING A POSITIVE KNOCKOUT many designers prefer to provide a relatively weak spring around the knockout rod. This spring is not strong enough to strip the part. Its function is to prevent unnecessary travel and bounce of the knockout to reduce wear

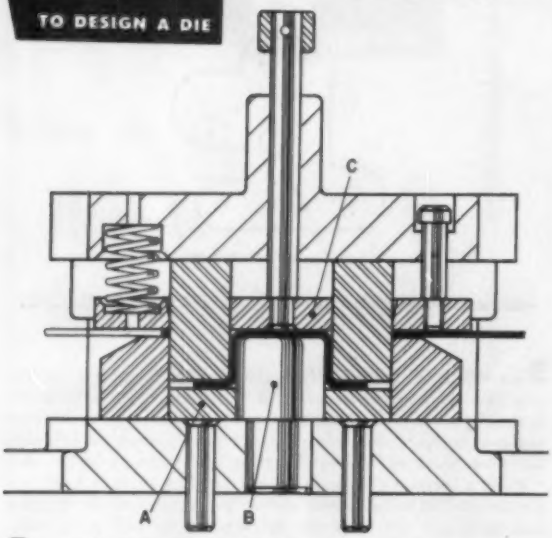


6.. SLENDER PIERCING PUNCHES may be guided in the knockout by providing hardened bushings pressed into the knockout plate. Close fits between the knockout and other die components must be maintained

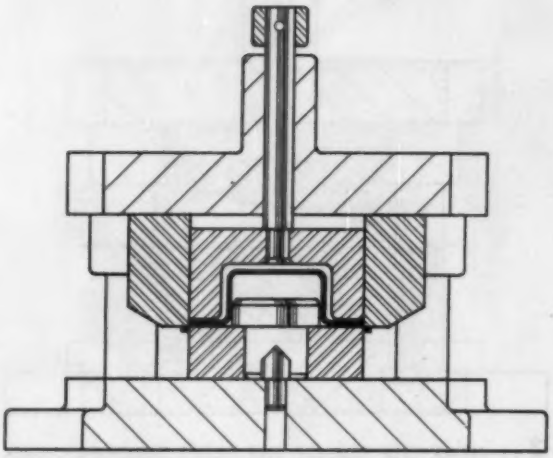
PLEASE TURN PAGE

14 steps TO DESIGN A DIE

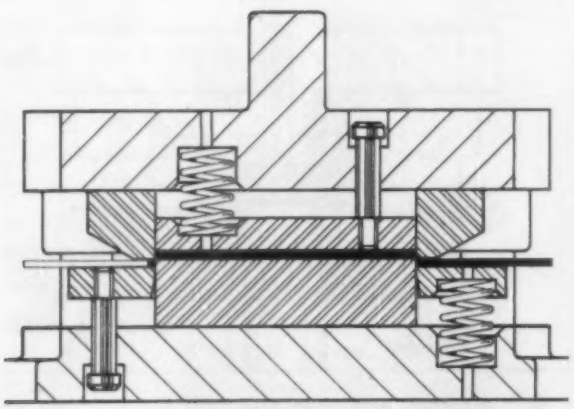
How to design strippers . . .



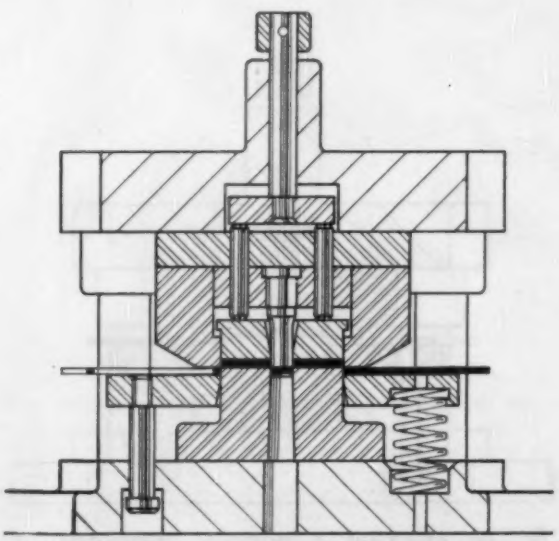
7 . . POSITIVE KNOCKOUTS may be used to eject drawn shells. In this combination die, the upper punch blanks a disk from the strip, and in further descent draws it into a flanged shell. Lower knockout *A* is raised by pins actuated by the air cushion of the press, and it strips the shell from around draw punch *B*. Positive knockout *C*, actuated near the top of the stroke, removes the shell from within the die and it falls to the rear of the press



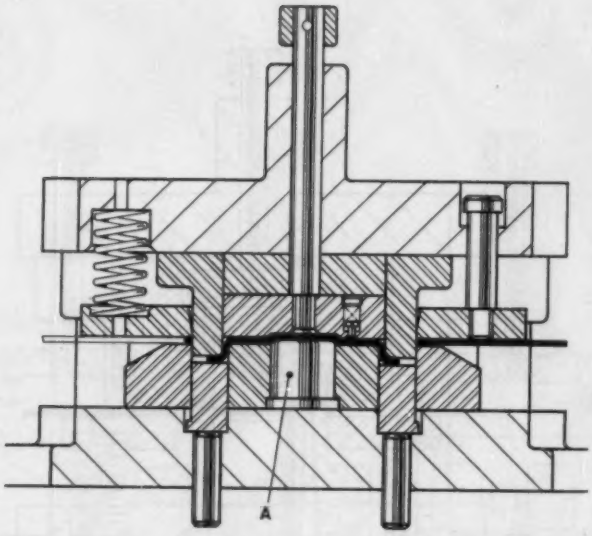
8 . . IN THIS TRIMMING DIE for a previously drawn flanged cup, a positive knockout, relieved to clear the shell body, removes the shell from within the die hole. Whenever a knockout is used to remove formed parts, it should be relieved so that stripping pressure is applied only near cutting edges to prevent distortion of the parts



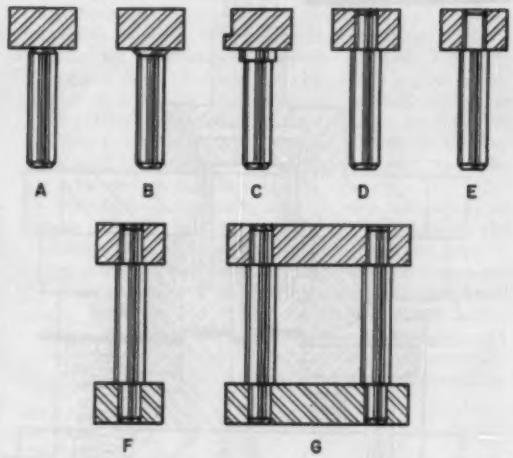
11 . . SPRING KNOCKOUTS are used in dies too large for the positive types. Stripper bolts limit travel. One disadvantage is that the blank is returned into the strip and must be removed from it subsequently. In some progressive dies the blanking station is provided with a spring knockout to return the blank into the strip for further operations



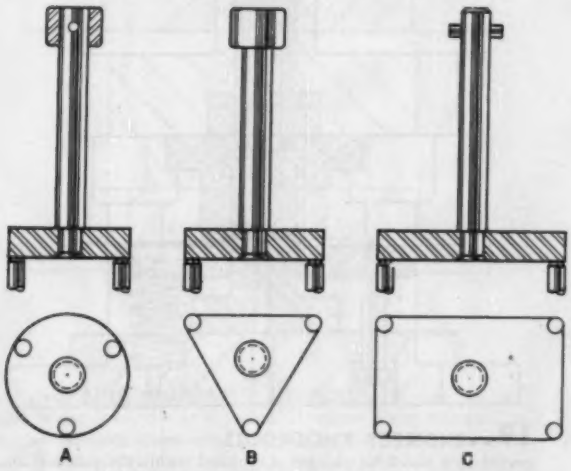
12 . . INDIRECT KNOCKOUTS are used when piercing, or other types of punches are in line with the knockout rod. This illustration shows an indirect knockout with pressure transmitted through pins to clear a central piercing punch. The knockout plate moves in a recess milled in the upper punch holder of the die set



9..FOR SOME TYPES OF WORK the knockout provides the final forming operation. This combination die produces a flanged cover by blanking a disk and drawing a shallow flanged shell. At the bottom of the stroke the knockout, in conjunction with the lower embossing punch *A*, embosses a shallow recess in the part. When knockouts do forming they are backed up by a plate to "spank," or "set" the form. A shedder pin, backed up by a spring and socket lockscrew, prevents adhesion of the part to the knockout face. When forming is done the knockout plate is made of hardened tool steel

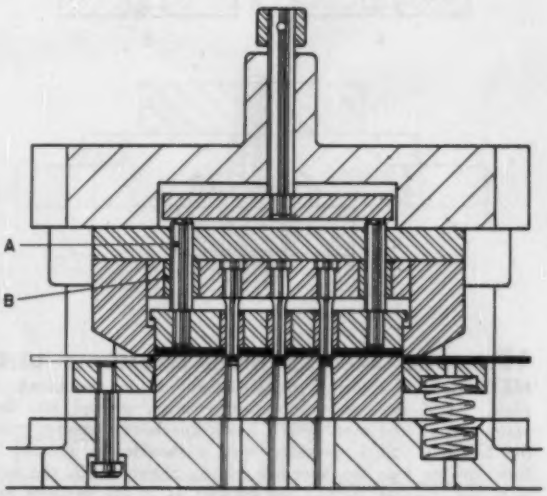


10..BOTTOM KNOCKOUTS, operated by the press air cushion, as in Figs 7 and 9, may be applied in seven ways. At *A*, pins transmit pressure from face of air cushion to underside of knockout ring. This method is suited to very long press runs. The loose pins may become lost if the die is removed often. At *B*, the pins are peened, then machined to form beveled heads, to prevent dropping out when the die is removed. At *C* turned heads retain the pins in the die set. The knockout ring has a flange to retain it in the die. At *D* pins are turned down and pressed into the knockout ring, while at *E* the pins are turned down and threaded into the knockout ring. At *F* in the "up" position the collar seats against the bottom of the die set to limit travel, also retains pins and knockout ring. At *G* long, rectangular knockout plates used in bending and forming dies are retained in the die set by two or more pins pressed into the knockout bar and also into the bottom retaining bar



13..THE NUMBER OF PRESSURE PINS used and their arrangement depends upon part contour and size. At *A*, knockouts for round blanks have three actuating pins. At *B*, blanks with a roughly triangular shape are also provided with three actuating pins. As at *C*, rectangular blanks require four pins.

There are three ways of applying stop collars to the knockout rod. At *A*, a collar is pressed over the end of the knockout rod and retained by a dowel pressed through both. At *B*, the knockout rod has a solid shoulder. At *C*, the dowel can be sheared by improper press setup and die damage will result

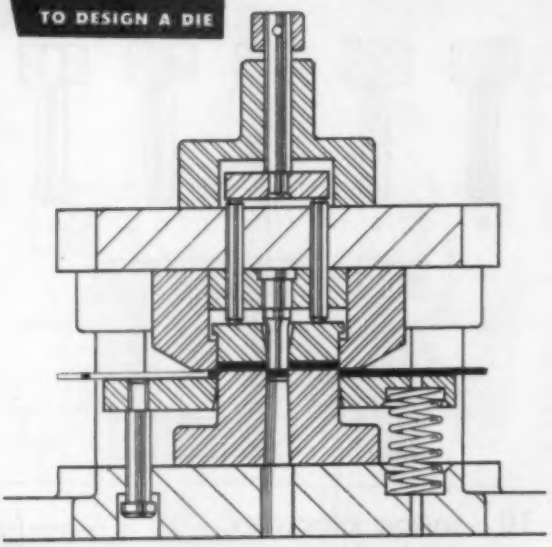


14..SLENDER PIERCING PUNCHES may be guided in the knockout plate of indirect knockouts. Guide pins, *A*, pressed into the knockout plate, transmit stripping pressure and also guide the plate. They are fitted in hardened bushings *B*. The knockout plate travels in a recess machined in the punch holder of the die set

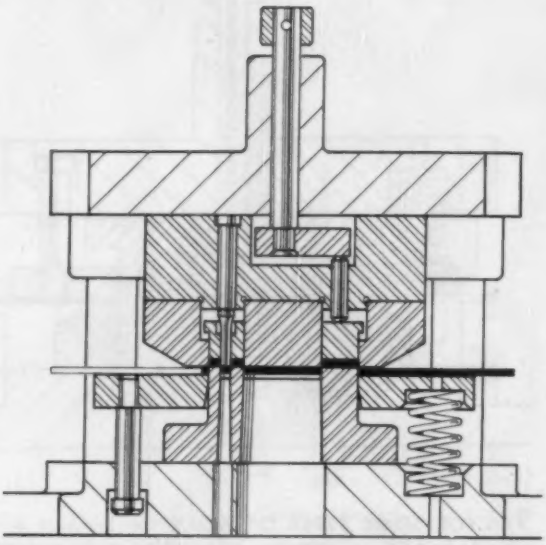
PLEASE TURN PAGE ▶

14 steps TO DESIGN A DIE

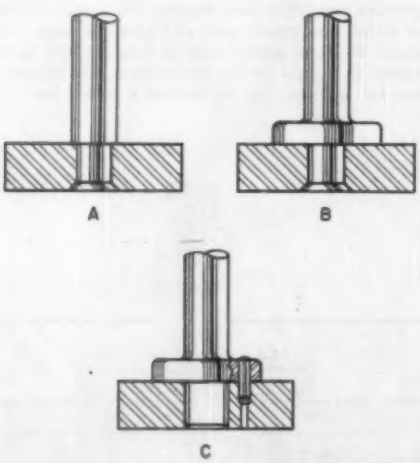
How to design strippers . . .



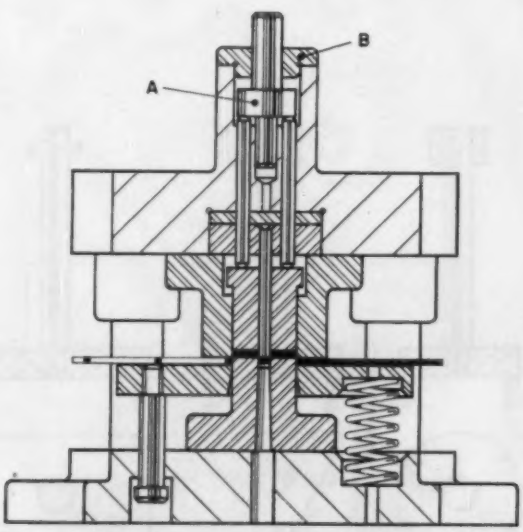
15 . . WHEN THE PRESS has sufficient opening, an auxiliary punch shank may be fastened to the punch holder of the die set. The knockout plate travels in a recess machined in the bottom of this auxiliary shank



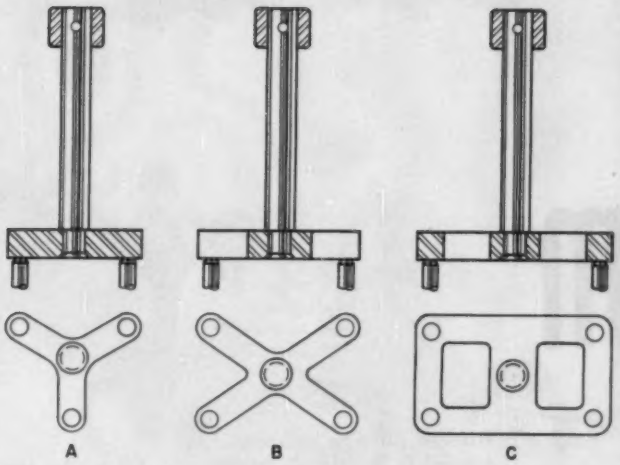
16 . . WHEN HOLES ARE TO BE PIERCED in ring-shaped parts the knockout plate has a spider shape and the punches are retained between the arms of the spider. On the drawing, one arm of the spider is drawn at one side, and one of the piercing punches at the other



18 . . THESE ARE THE THREE COMMONLY USED METHODS of securing the knockout rod to the knockout plate. At *A* the rod end is turned down, pressed into the plate, and riveted over. When heavy knockout pressures exist the knockout rod is provided with a shoulder to prevent it from sinking into the knockout plate. Shown at *B*, the end is turned, pressed in, and peened over as in the previous example. At *C* is shown still another method of fastening heavy knockout rods. The end is provided with a shoulder, threaded into the knockout plate, and prevented from loosening by a dowel pressed through the flange and into the knockout plate. The dowel hole is carried through the plate, but with a smaller diameter to prevent the dowel from working out in operation

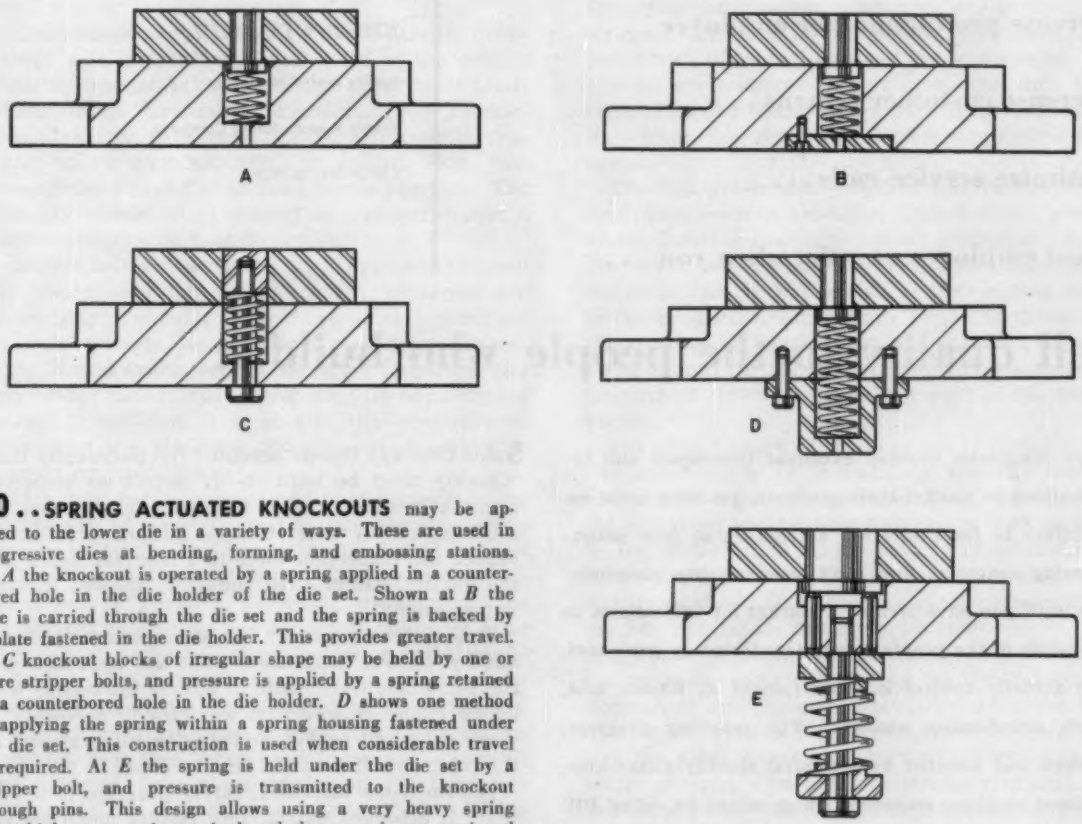


19 . . INDIRECT KNOCKOUTS for small dies may be operated by a knockout plunger *A*, applied within the punch shank. Cap *B*, fastened to the punch shank with socket capscrews, provides an outboard bearing for the knockout plunger and also keeps it confined within the die. Small indirect knockouts may be of the spring-operated variety (not shown). One disadvantage is that the part is returned into the strip and it must be removed as an extra operation



17..THE NUMBER OF ARMS contained in knockout spiders depends on the number of piercing punches required. When three punches are applied the spider has three arms to clear the punches. This type is shown at *A*. For four punches a four-armed spider, as at *B*, would be used. Piercing punches, applied at other than radial locations, are cleared by holes in knockout frames such as the one shown at *C*. The shape of the knockout frame would depend upon the number and arrangement of the punches.

One method frequently used to save material is to flame cut the spider knockout entirely through the backing plate. The spider removed from the plate is then machined thinner to allow up-and-down movement. Still another method of applying large spider knockouts is to flame cut the spider through the punch holder of the die set. A steel die set must be specified, and the flame cutting must be done by the die-set manufacturer before stress relieving and final, accurate machining



20..SPRING ACTUATED KNOCKOUTS may be applied to the lower die in a variety of ways. These are used in progressive dies at bending, forming, and embossing stations. At *A* the knockout is operated by a spring applied in a counterbored hole in the die holder of the die set. Shown at *B* the hole is carried through the die set and the spring is backed by a plate fastened in the die holder. This provides greater travel. At *C* knockout blocks of irregular shape may be held by one or more stripper bolts, and pressure is applied by a spring retained in a counterbored hole in the die holder. *D* shows one method of applying the spring within a spring housing fastened under the die set. This construction is used when considerable travel is required. At *E* the spring is held under the die set by a stripper bolt, and pressure is transmitted to the knockout through pins. This design allows using a very heavy spring when high pressure is required and the press is not equipped with an air cushion

Rheem quality insignia . . .
designed by Wally Kroll, machine shop, was selected from among 81 contributed designs. Creating an insignia causes people to think about the real meaning of a word. For his effort, Wally won a fine camera—and the prestige of having his design used throughout the program

Reduce scrap and rework costs . . .

Increase production per employee . . .

Decrease customer returns . . .

Minimize service calls . . .

Boost employee morale, when you . . .

JOSEPH F DE KLOTZ,

quality control manager,

Rheem Manufacturing Company,

CHICAGO, ILLINOIS

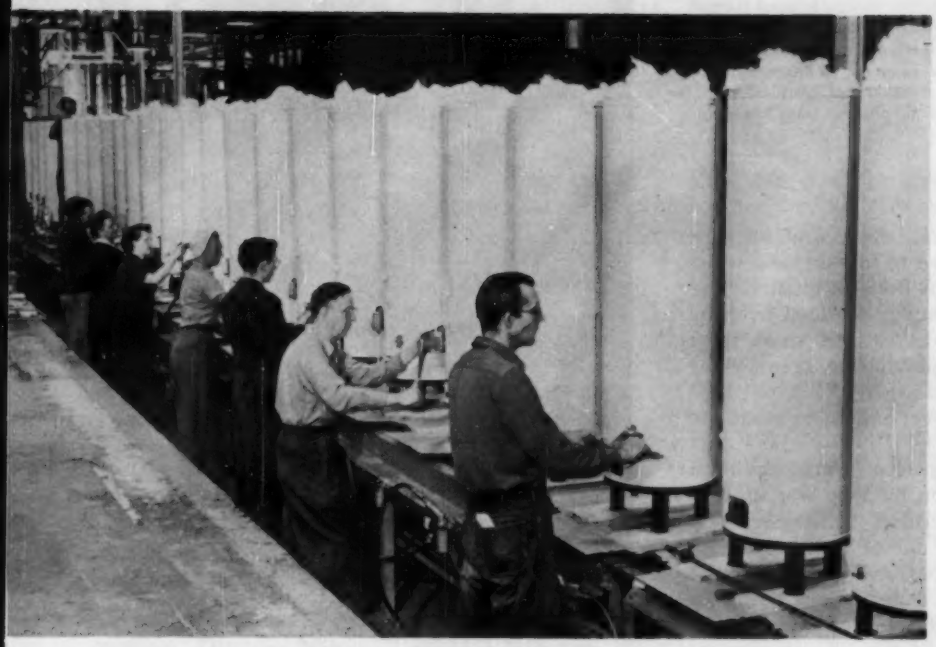
Sell quality to the people who build it

Many companies develop excellent techniques and organizations to market their products, yet they insist on directives to force internal acceptance of new manufacturing concepts. You can't order quality consciousness until you have created a market for the concept in the minds of the people, your manufacturing personnel, who actually control it. Management at Rheem said, "Let's merchandise quality!" The resulting program, planned and directed by a Central Quality Committee, is based on three essentials which might be called PIE — Prestige, Incentive, and Education.

Some time ago Rheem accepted the philosophy that, "Quality must be built in—It cannot be inspected into the product." After following this precept for a comparatively short time, it became practical to reduce the Inspection force to a nominal figure and the quality, rather than suffering, showed marked improvement.

This outcome proved to Management and the quality control department that the approach was correct. Plans were made to pursue the course with added vigor. However, it was clearly necessary to make each and every employee an integral part of the program. How could this be done?

Rheem has a successful safety program in operation. It achieved outstanding results when a Central Safety Committee was established which mer-



One focal point for quality . . . production is this water-heater assembly line. Unless the actual assemblers build in quality, it will never be achieved. Later inspections contribute nothing to the product

chandised safety to the individual employee. When employees were aware of their need, safety was readily sold.

Thus, about one year ago a *Central Quality Committee* was established. It consisted of the quality control manager as chairman and department heads of Personnel, Purchasing, Engineering, and Production. Initially, this group drafted a six-month program which went into effect in August, 1956. Top management gave full backing to the program. The first six-month effort proved so successful that a second program is now in progress.

Rheem believes in the statistical approach to quality control and the quality control managers are thoroughly trained in the theory and application of these methods. As a matter of fact, standard sampling is used exclusively in Receiving Inspection and records are maintained on each supplier of purchased parts. In addition, it is occasionally necessary to determine the standard deviation of a particular process or operation.

However, for in-process and final inspection, the philosophy of building quality into the product is rigidly followed. This places the burden of responsibility for quality on the first-line production supervisor. It requires thorough training of the employees on his part and continual follow up after the training period. Quality Control prepares standards and procedures covering all operations and supervisors are furnished copies of these documents. Quality Control, through a small staff of roving inspectors, sees that these procedures and standards are followed. In a plant employing approximately 900 people, five inspectors can adequately handle the job.

A never-ending war on scrap is carried on throughout the plant. The focal point of the attack is a "scrap board" located at the employee entrance. Examples of spoiled products which must be scrapped are hung on the board. Each item is labeled with the actual cost and the scrap value. Employees are concerned about scrap and they voice their disappointment when they discover that an item from their department is hanging on the scrap board.

The first six-month program was twofold: The first phase covered education. This includes a series of six monthly meetings for all production supervisors and was designed as both a refresher course and to accent the importance of the training aspect in the production supervisor's job. The theme was "Quality cannot be inspected into a product but must be built into it." This, therefore, implies thorough training of the workers on the part of the supervisors.

The second phase of the program provided incentive and recognition through six monthly contests and one six-month contest open to all employees in the plumbing and heating divisions as well as those in the departments which service these divisions. These contests arouse the interest of employees in quality production and thereby aid the supervisor in his job training for quality production.

A dinner meeting, held in July, 1956, to kick off the program, was conducted by the Central Quality Committee and those in attendance were the Production supervisors, representatives of the sales staff and the plant manager. The dining room was literally covered with placards stressing quality and the focal point was a backdrop bearing a quality slogan and various quality emblems.

Several pieces of "low-quality" silverware were

New suits, . . .
one each week, were given as prizes for winning quality improvement ideas submitted during January. William Fahey, resident plant manager, presents merchandise certificates to four of the winners. Ideas covered all phases—from burrs to design to long-term storage

randomly distributed among the place settings. These pieces were constructed to fold or bend when used, thus served to accent the need for quality. The business portion of the meeting, presided over by the quality control manager, featured short talks by the personnel director, purchasing agent, chief engineer and production manager. Each of these men was introduced by a novel exhibit to stimulate interest.

A large inflated rubber figure of a man having a a rather stupid expression on his face was used to introduce the personnel director. It was stressed that the personnel director meets and talks with applicants of all sizes, shapes and types and that one of his problems is most definitely the sizing up and selection of people he feels will produce quality work.

Because materials play an important part in the production of quality products, balloons were used in the introduction of the purchasing agent. Three balloons were taken from a single box, were attached to a manifold, and were inflated by means of a pressurized can of gas. Athough all three balloons were subjected to the same pressure, one of them, as might be expected, broke before the others. The inference here, of course, was that parts produced under the same or similar conditions, and out of the same raw materials, vary in quality and that the purchasing agent is confronted with the problem of obtaining the highest quality materials possible.

Screwmachine parts, apparently identical, were used to introduce the plant engineer. The point here was that, although the parts had been produced out of the same material and on the same machine, sizable variations were present. One of the problems facing Engineering is to design and build tools and equipment which will produce parts within specifications.

Four plastic horns, obtained from a local dime store, were used to introduce the production manager. These toys were selected out of a tray containing approximately 25 horns and three of them were defective. Each of the horns was fitted with a brass double reed, and, if made correctly, should have produced two harmonious tones—one low and one high. The four horns were given to four people at the speakers' table and each was asked to blow his in turn. The first horn blew only the low note. The second horn sounded the high note, the third horn sounded both tones, and the fourth made no noise.

The point emphasized here was that although the assembly workers must have been provided with similar parts, three defective units found their way out of the plant. The Production Manager pointed out in his talk that proper training of workmen is the key to successfully producing a quality product.

In launching the first six-month campaign, the program was divided in three phases:

Education •
Contests •
Publicity •

At the outset, educational sessions, one each month, were programmed for *all* supervisors. At the first meeting on August 9, 1956 the new approach to quality consciousness was explained. Then a number of specialists described the important quality guideposts such as blueprint accuracy and change notices, with emphasis on interpretation and distribution channels. Each supervisor was given a checklist on which he was to maintain a written record of scrap and rework. A ten-minute question and answer period closed this session and was the standard wind-up for all sessions.

The second session, in September, was devoted to an appraisal of Rheem products by Rheem salesmen and their customers. Following this thought provoking analysis, one of the discussion leaders gave an over-all picture of quality problems at all of the plants.

In October emphasis was given to the time and money wasted on returned goods and service calls and the problems were made graphic by a display of returned defective parts. Supervisors were shown that the customer inspects too.

Meeting Four covered specifications for purchased parts plus a review of statistical quality control techniques. Special quality problems with government products were also discussed. Costs involved when defective products are shipped, in terms of the sales department and other cost centers, plus the cost of scrap and rework, were outlined at the fifth

Scrap board . . .
shows the cost of poor quality for all to see. Items are changed every week

meeting. The final session in January was used to summarize the ideas advanced in earlier sessions.

Green, billfold-size cards describing the ways to obtain quality work were distributed to all supervisors and employees at the first session after an emblem had been adopted. Copies of the card also were sent to employee's homes. The emblem resulted from a competition in which 81 entries were submitted. These employee quality cards were serially numbered, like membership cards, and were used as the basis for one of the quality contests.

For each month of the program, a contest was scheduled. In August, the first month, employees were asked to submit sketches for the emblem. First prize was a personalized camera, second prize was a personalized fitted train case, and third prize was a personalized pen and pencil set. The winning emblem was used on the green cards and in the new quality column in the company newspaper.

In September a slogan contest was held on a daily basis, Monday through Friday during each week of the month, with daily prizes and a grand prize—a two-suiter suitcase—for the best slogan of the lot.

During October members of the Central Quality Committee went through the plant asking people to quote the grand-prize-winning slogan. People who did so received a silver dollar if they also could answer a question such as, "What is the most important thing to watch in your operation to produce the best possible quality?" No two silver dollars were alike—they varied by date and mint. At the end of the month there was a drawing for a grand prize, two snow tires, based on the silver dollar dates and minting. To win, the person drawn had to show his silver dollar. Throughout the month 100 silver dollars were distributed.

The November contest provided daily prizes according to the serial numbers on the green cards and, of course, the holder of the winning number had to have his card on him to win. This contest was initiated by a home mailing to describe it.

A suggestion contest was conducted in December for the best idea to improve Rheem quality. Grand prize was a clock-radio. A train case and a pen-and-pencil set were given as consolation prizes.

For January, the last month of the initial program, each first-line foreman was asked to nominate the employees he supervises who excel in quality, devise ways to improve the quality of their work, or submit suggestions for improving quality. From the nominees, one winner was selected each week and received a gift certificate for a $75 suit of clothes.

During the second six-month program there is a six-month limerick contest with one grand prize—a major Rheem appliance such as an electric range, clothes dryer, water softener, water heater, or a two-ton air conditioner.

Publicity for the program was developed in six areas:

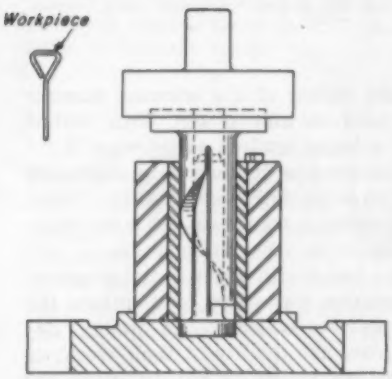
1. Information to all plumbing and heating jobbers about the program, including product changes.
2. A "mystery writer" article in each issue of the plant paper, StRHEEMlines, pointing out the worst quality situations seen during the preceding period.
3. Thought-provoking messages about quality printed on all time cards and pay envelopes; also letters to homes.
4. A booklet describing the quality program, for distribution to new employees.
5. Posters, placards, and displays urging quality consciousness.
6. Stories in local community newspapers.

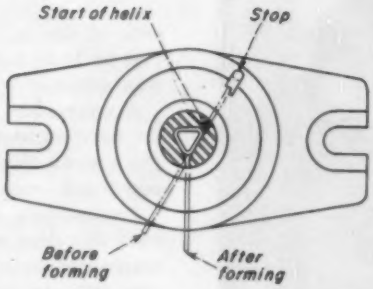
Planning for the educational phase of the second six- month program emphasizes quality in developing standards for methods and incentive. Topics also include personnel testing and training, housekeeping, and the effect of quality on non-manufacturing departments.

Contests in the current program were developed by the Central Quality Committee and prizes were given for a daily slogan, for guessing the number of defective parts in a barrel, guessing the number of defective boilers and tanks returned in the month, and finding the defects in a composite picture of the various Rheem products. During the entire 12-month program, the average cost of prizes was less than $100 per month.

The entire quality improvement program was budgeted, for one year, at less than $4200—with slightly more than half going into the first six months. Results are outstanding, but most important is that the effort has been pleasant for everyone and everyone has had, or is enjoying, a piece of the PIE—Prestige, Incentive and Education.

Practical Ideas





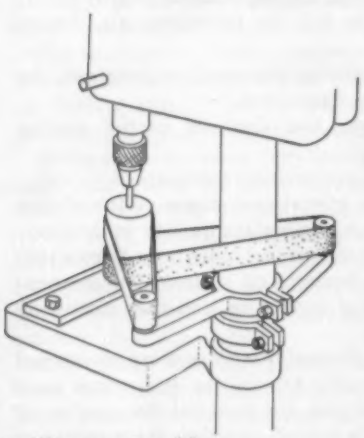
Wire Bent In Wrap-Around Die

An order for a large lot of special wire links was ours. Production did not warrant expensive tooling, and hand-operated bending fixtures, we felt, would be too slow. Instead, the wrap-around die illustrated was made for a small punch press we had.

The wire is inserted along the side of the center stake until it hits the stop. As the helix-shaped punch descends it wraps the wire around the core part of the stake. This is a hand-fed operation, but the idea can be incorporated in a combination die which will cut the wire and bend it in one stroke.

The bend shown is triangular, but it could be square, round, or any shape desired.

Alex Knudsen, Rocky River, Ohio



Drillpress Doubles As Belt Grinder

An abrasive belt-grinding and polishing machine has a definite place in the tool room. The cutting action is not as violent as free-hand grinding on an abrasive wheel, but is excellent for chamfering, deburring, removing nicks and tool marks, and for sharpening small tools, in addition to conventional belt polishing.

We didn't have a commercially made belt sander, when we had some burr removing to do, so we rigged up the drill press, as illustrated, and made a belt grinder out of it. No actual changes were made to the drillpress, and the setup can be torn down in a couple of minutes.

A 4-in. hard-rubber roller was supplied with a shaft extending at both ends. One end of the shaft was chucked in the drillpress spindle, while the other end was supported by a sealed ball bearing pressed into a steel plate. This plate was bolted to the drillpress table after the shaft had been inserted into the bearing, aligning it.

Idlers were mounted on arms which were clamped to the drillpress column, making adjustment for belt tension easy. Care should be taken in building these arms so the axis of the idlers is parallel with the column, otherwise the belts will either run off the idler pulleys or down on the arms.

The reason for the two belts shown is that we needed two grits, a coarse and a fine. If only one belt is necessary, the job of construction will naturally be even simpler. Removing or replacing belts is easy. Simply loosen arm clamps, disconnect shaft by loosening chuck, and lift spindle.

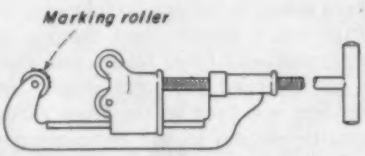
Buckley Sullivan, Cleveland, Ohio

Scale Checks Spring Compression

It is often of utmost importance that a number of coil springs have identical compression. The way we measure a sample spring and compare the ones we manufacture is with a bathroom scale set under the spindle of a drill press.

The sample spring is placed between the chuck and the scale and compressed to a specifically recorded weight. For an average spring this is usually about 50 pounds. The feed stop is then set at this point to insure that all springs will be compressed to the same degree. Deviations in compression are then readily discovered.

Harvey Muller, Danboro, Penna

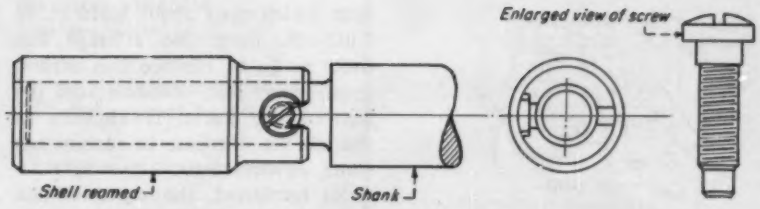


Pipe Cutter Stamps Round Parts

We recently had to stamp some numbers on several thousands of round diecast parts. (Numbers were later included in the die). Because of their overall shape it wasn't practical to set them up in a lathe or roll them in a milling machine. This method proved to be faster than expected:

A pipe cutter was altered to take a marking roller, replacing the cutter disk. The tool was opened enough to slip the part between the rollers. It was then closed and given one turn. This rolled the number onto the part.

Clifford Malloy, Bronx, NY



Screw Holds Shell Reamer On Shank

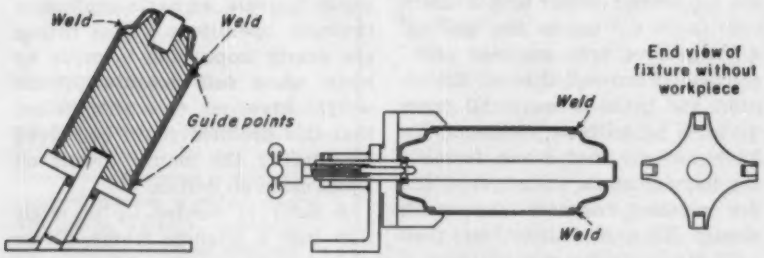
The pin diametrically inserted through a shell-reamer shank drives the reamer, but does nothing more. Many machinists know from experience that this has some disadvantages. The reamer will sometimes be lodged in the bore when retracting is attempted.

A more efficient and safer way is to replace the drive pin with a locking drive screw as illustrated. The first step after removing the old drive pin will be to open the hole to a suitable tap-drill size and tap it. A screw is made with a thread to fit this hole and with a shoulder under its fillister head. A plain shank is turned on the end of the screw to the identical dia of the old drive pin.

One of the slots in the reamer is altered to accommodate the screw head and houlder. This is done by grinding out the bottom and sides of the slot to a clearance dia for the shoulder. A counterbore is either ground or carbide-milled to receive the screw head. The remaining flat portions of the slots are opened only enough to pass over the threaded part of the crew. Before putting the screw to use it should be hardened and ground.

To remove the reamer from the shank it is only necessary to slacken the screw a few turns, enough for the slot to clear the shoulder.

W M Halliday, Birksdale, Lanc's, England



Welding Fixture Simplifies Assembly

The design of the illustrated roller presented a definite obstacle in assembly and welding. The overall length had to be held to a certain dimension, and the holes in the end bells or cups had to be concentric with the OD. The tubes were saw cut and the cups left untrimmed after drawing, making gaging difficult.

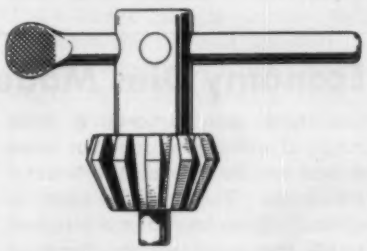
A fixture in two parts was made. On the first-operation part the welder slips a cup and a tube on. The cup nests on the top of the fixture resting on the inside of the crown and guided on the inside face of the rim. The bottom edge of the tube is held concentric by the offset machined on the center post, and at the top by the rim of the cup.

This fixture is inclined for easier access when welding. A thrust bearing located on the shaft carries the weight of the center spindle and makes for early rotation.

In the second operation, on the finishing fixture, the welder places a cup on the shaft up to the faceplate. A turn on the handwheel moves the tapered shaft in and the pins outward, holding the cup in place. The open end of the tube is then slipped onto the fixture and over the rim of the chucked cup. The tube edge which is used for gaging in the first operation is now resting on four gage posts that maintain proper height. This fixture is also made to rotate for easier manipulation.

After welding, a counter-clockwise turn of the handwheel relaxes the grip of the cup so the roller can be removed. The return of the holding pins is assisted by a ring of spring wire seated in a groove around the center post and through slots in the end of the pins.

E A Werner, West Bend, Wisc



New Hole Doubles Life Of Key

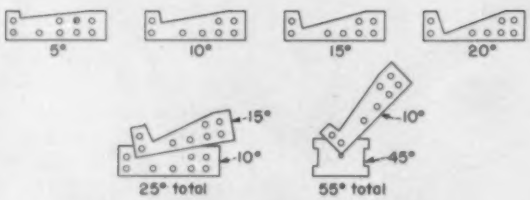
A worn geared-chuck key, which normally would be thrown out, can be saved by changing the position of the handle. This is done by drilling a new hole 90° to the original.

The key wears at about the same 3 or 4 teeth because it is held and used in the chuck at a repeated hand angle. The new hole will actually provide two extra locations for the handle, making a total of four, 90° apart.

When the key shows signs of wear and starts to slip, just shift the handle to the next hole, and the key is as good as new. This will not only spare the rack on the chuck, but it will also prevent many skinned knuckles.

Frank La Saracina, New York, N.Y.

Practical Ideas



Angle Blocks Permit Precision Layout And Machine Work

There are many uses for angle blocks such as these shown. We have used them in combinations for a variation of angles, or they may be used with 45° V-blocks to gain angles greater than 45°.

They can be used in vises, milling machines, lathes, and grinders. But we have found that they save the most time and avert the chance of human error on the layout table, in setting up and laying out work to be machined.

The outside dimensions of these blocks were standardized; 3½-in. long, 1¼-in. wide, and ¾-in. thick. Some metal was removed by drilling a few holes longitudinally to make them lighter.

The blocks should be made of a steel that will permit heat-treatment. CR steel will do fine, with a case hardening before final grinding. Because of the accuracy demanded in the finished product, a sine plate should be used in the grinding setup.

Harold A Brimner, Logan, Ohio

Economy Dies Made Of Cast Iron

Our firm manufactures a wide range of metal products, but more or less concentrates on sheet-metal stampings. These parts vary in quantity from less than a hundred to 150 thousands per die. For such relatively short runs it has been found that cast iron forms an excellent die material for drawing and forming.

It has also been discovered that if, on multiple-operation dies, the cast iron won't hold form for the entire run, a final restrike die of steel will do the trick, and the cost will still be less than for a complete set of steel dies. Our master mechanic has done a lot of experimenting and comes up with the following information:

• Although both soft and hard cast iron and a few compositions have been tried, the results do not indicate that any particular composition or type of cast iron must be specified.

• Under normal conditions (clean stock and proper lubrication) the cast iron dies wore no more rapidly than hardened alloy steel dies.

• When properly lubricated, the porosity of the cast iron retains the lubrication better and actually cuts down die marks and galling.

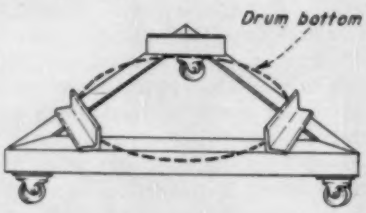
• Parts have been made of cold-rolled and hot-rolled steel, aluminum, and brass in nearly all gages up to ⅛ in. without problems. We have noticed that when forming the heavier stock, no edges of the die working against the stock should have a radius less than 1/64 in.

• The die sections were hardened after machining and before final grinding. Temperatures from 1550 F to 1600 F were used. The work was left in the furnace about one hour per inch of thickness at the thickest portion of the part. It was then quenched in oil and tempered at 500F for three hours; longer if very heavy sections were involved.

• The tempering is apparently more important than the hardening. This produces a core hardness of about 50 R_c, but there is a soft skin which runs about 0.010 in. to 0.015 in. deep. No attempt has been made to replace the carbon apparently lost, because of the size of the parts. It appears as though the decrease in carbon has some advantage.

• So hardened, the material can only be machined with carbide tools, but it responds readily to grinding. A fine surface finish can be achieved. Grinding time is fast. Cuts from 0.006 in. to 0.008 in. can be taken before the problem of rapid wear of the wheel is experienced. A lot depends, of course, on the size of the work, the dia and width of the wheel, and other relative factors.

Richard Minser, Cleveland, Ohio



Dolly Makes Drums More Useful

Many plants use steel drums or paper 'barrels' as parts containers between operations. Thus drums are nearly impossible to move by hand when full because of the weight involved. One shop found that this problem could be solved by placing the empty drums on small castered dollies.

A dolly is welded up of angle iron into a triangle frame. Three swivel casters are welded to the underside of the corners. Three short pieces of angle iron are welded to the corners on the top side of the frame, spaced to accommodate the bottom of the drums.

In the case of the paper 'barrel', a flame-cut disk of steel is laid on the dolly to support the bottom of the barrel, which, though steel, is light gage. Previously, the paper barrels were useful only as 'dead' storage because they could be neither moved by hand or picked up with a lift truck.

Buckley Sullivan, Cleveland, Ohio

FEDERICO STRASSER
Santiago, Chile

won $25 in addition to regular payment for his idea:

ALTERED GAGE COMPLETES CHECK

in the April 8, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

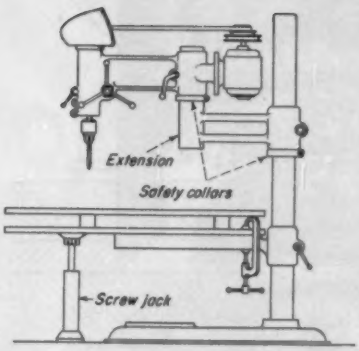
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Column Extension Increases Drillpress Capacity

We recently had a job to drill a number of holes in a few large 1-in. plates. The size of the plates made it impossible for us to reach the center portion where most of the hole locations were located. Because of the thickness of the plate, we dared not use an electric hand drill.

To overcome the capacity limitation of our drillpress, we made the extension shown in the sketch. It is made up of a stub post and a sleeve joined by two pieces of channel iron welded between them. The stub-post is in reality a piece of extra heavy tubing whose OD is machined to the same dia as the original drill post.

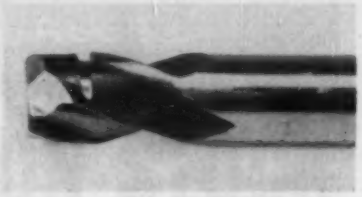
The sleeve is bored to suit the dia of the drill post. This is best done after the welding has been completed to avoid any warping effect on the bore by the weld. It will also provide a means of assuring axial parallelism between the bore and the stub post. The sleeve is then slit through the wall, diametrically opposite the channel irons, and through a piece of round stock welded in place to form a locking device. This piece is drilled and tapped for a ½-in. locking screw.

Two safety collars are made; one to fit the drillpress post supporting the sleeve, the other to fit the stub post and to support the original beam.

As our drillpress table was too small to handle the work, a scrap plate was clamped to it. Two screw jacks were used to support the overhanging edge of the plate.

With this setup we were able to use the press pretty much like a radial drillpress. There was no need to move the plate at all. We'd simply loosen the two clamping bolts, position the drill, and retighten the bolts.

Robert Sirois, Lawrence, Mass.



Combination Drill-Reamer Made From End Mill

We had to produce a large number of ⅜-in. holes in thin aluminum plates (up to ¼-in. thick). Our specifications called for a fine finish within close tolerances. This indicated the demand for a drill-reamer combination, because it would be unthinkable to change from drill to reamer with every hole.

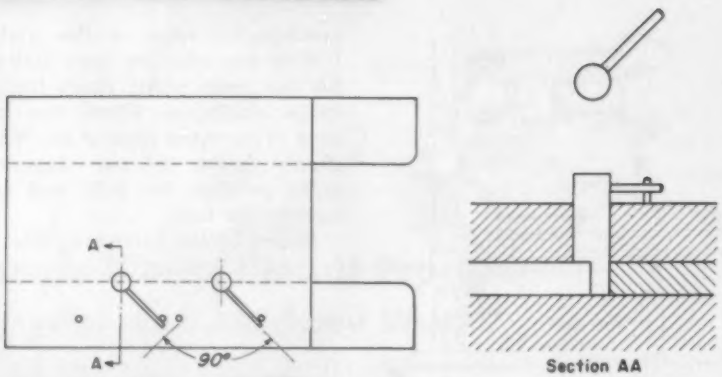
After having looked over some commercially available combination drill-reamers we decided to make our own. The photo shows our first successful combination. We have later improved it by grinding three grooves on the 0.375-in. dia (1/16-in. deep and ⅛-in. wide) to serve as chip clearance and burnisher.

A regular ⅜-in. two-lipped end mill was selected and ground down to 0.365 in. for a distance of 5/16 in. A relief of 1/16 in. was ground to give us a cutting edge on the 0.375-in. dia.

Guided by a drill bushing, this tool has produced ⅜-in. holes $\frac{+0.0005}{-0.0000}$ in. in aluminum with satisfactory consistency. We have also found that this type of tool will produce a counterbored hole for ball-bearing mounts just as efficiently.

K F Theobald, Link Aviation, Binghamton, NY

Practical Ideas



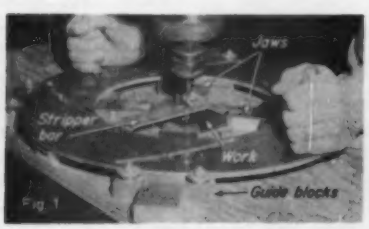
Pin Stops Are Effective And Economical

A simple way of fitting progression stops in a die is shown in the accompanying drawing. Instead of milling out slots in the guide strips for sliding stops, as is usually done, it is necessary only to drill and ream a hole for each stop through the stripper and guide. The center distances of these holes are equal to the required progression of the material, and the holes are centrally located on the edge of the guide strip.

The stops are made of drill rod, cut away as shown in the sectional view. A piece of smaller-dia drill rod is inserted in the stop at 45° to the flat to serve as lever. Stop pins inserted in the stripper limit the radial motion of the staging stops to 90°.

In operation, the flats on the stops are flush with the edge of the guide strips. This locates the lever at the right-hand limit stop. When the lever is turned 90° to the left-hand limit stop, the flat will project into the guide way.

C E Heaven, Greenford, Middlesex, England



Better Blanks Produced By Saw Fixture

As producers of large quantities of thin spur gears (mostly aluminum), we have found that piercing and blanking the disks caused excessive distortion, necessitating extensive straightening. Fig. 1 shows a holding fixture we designed for holding square blanks. This was made for the purpose of centrally drilling the pilot hole, later used in the sawing operation.

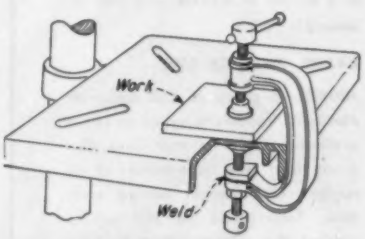
The fixture mounts on a piece of heavy plywood, its four jaws guided by blocks fastened to the plywood. The accurate cam slots in the locking ring supply the force to the jaws. As the ring is turned clockwise, the jaws close on the blank to be drilled. A stripper bar with two fingers prevents damage when drill penetrates the work.

Fig. 2 shows a standard woodcutting bandsaw. An auxilary table "1" is keyed to the slot "2" in the saw table guiding the work-loaded auxiliary table into the saw. Locking pawl "3" will lock the table in loading or operating position. A slot in the auxiliary table carries the pivot bar and provides adjustment for cutting various diameters. A zero line is marked on the pilot bar "4", while graduations are stamped on the table.

To cut a gear blank, the pilot bar is first set for the dia wanted. C ne of the previously drilled plates is dropped on the pilot and fed into the saw by sliding the auxiliary table forward. The plate is then rotated by hand to complete the circle.

All blanks are left 1/32 in. oversize to allow for finishing by turning after the hole has been bored to its proper size. Blanks from ¼ in. to 1 in. thick have thus been produced.

Karl F Theobald, Link Aviation Inc, Binghamton, N Y



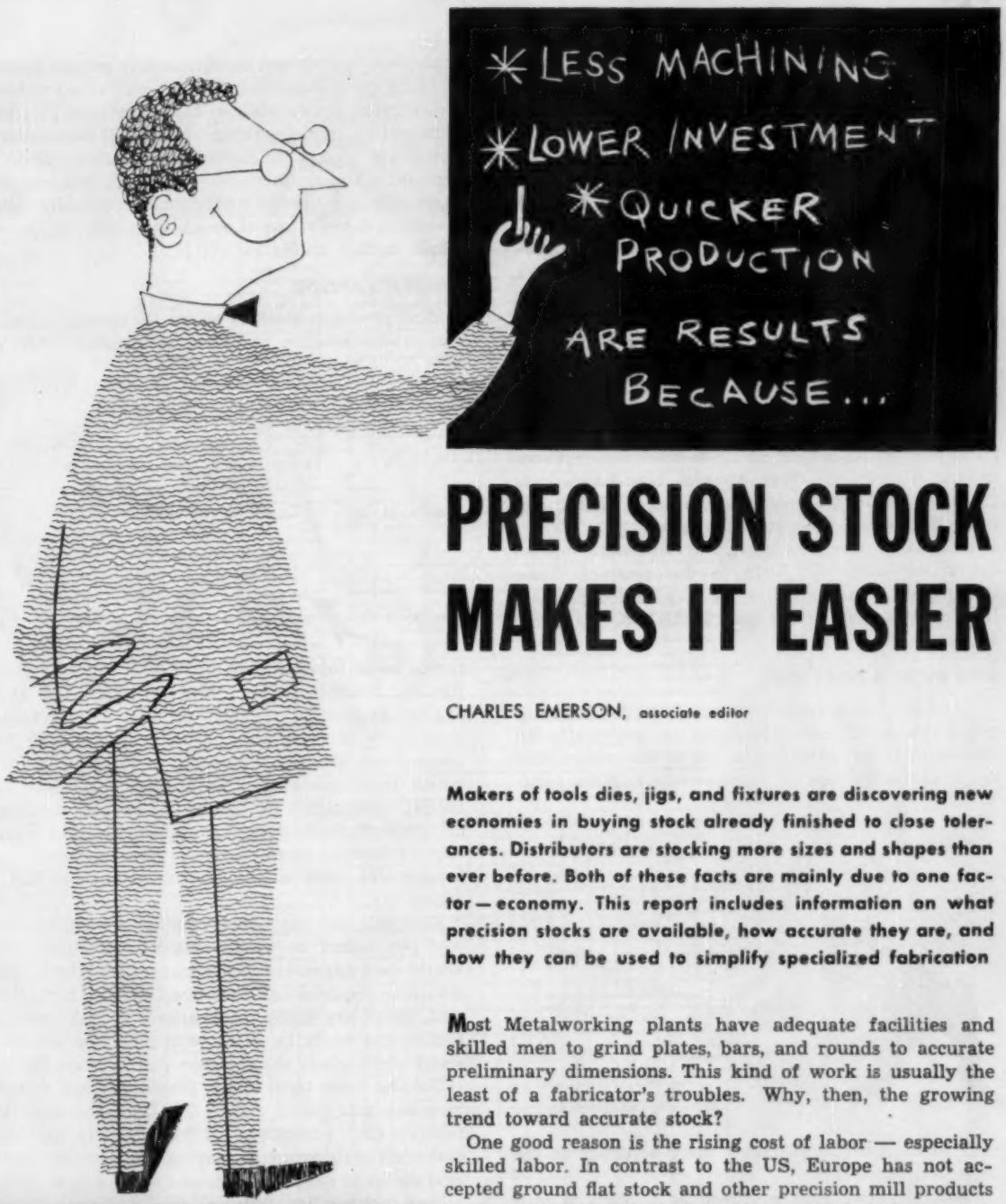
Altered C-clamp For Special Jobs

We have altered some C-clamps in our shop to provide an easy method of straddle-clamping. It permits the clamp to be used on a ribbed drill-press table without blocking. Another application is in holding parts to the side of an I-beam while drilling or welding.

To make the alteration, it is first necessary to weld a pad to the anvil of the clamp to increase its thickness. This is to get more threads in the hole for the new screw. Care should be taken when drilling and tapping this hole so that both screws line up perfectly. If they are not in line, the clamp is very easily sprung.

Because the original screw was intended to reach the anvil, it is too long and should be shortened to allow for the space taken up by the new screw. Each screw needs only be long enough to meet the other in the center of the opening.

Charles H Willey, Penacook, NH



PRECISION STOCK MAKES IT EASIER

CHARLES EMERSON, associate editor

Makers of tools dies, jigs, and fixtures are discovering new economies in buying stock already finished to close tolerances. Distributors are stocking more sizes and shapes than ever before. Both of these facts are mainly due to one factor — economy. This report includes information on what precision stocks are available, how accurate they are, and how they can be used to simplify specialized fabrication

Most Metalworking plants have adequate facilities and skilled men to grind plates, bars, and rounds to accurate preliminary dimensions. This kind of work is usually the least of a fabricator's troubles. Why, then, the growing trend toward accurate stock?

One good reason is the rising cost of labor — especially skilled labor. In contrast to the US, Europe has not accepted ground flat stock and other precision mill products to the extent they have been demanded in this country, primarily because the relative labor cost is lower. But labor is not, by far, the only reason for precision stock:

• Metal mills can handle rough and moderately close machining just as well as the specialty shop, and can do so in much larger quantities, which means lower unit cost. If the specialty shop can accept precision stock of standardized dimensions and can do little or no roughing before

American Machinist
SPECIAL REPORT NO. 445

COPYRIGHT 1957 BY McGRAW-HILL PUBLISHING CO, INC.
330 W. 42nd ST, NY 36, NY

special operations are started, net cost will be lower.

• Quality of precision stock is normally better than will be found in mill-run products — fewer inclusions, more uniform grain structure, less porosity and gas. Surfaces are machined free from decarburization, and many materials are spheroidize-annealed. Mill inspections are more cautious and quality control is more rigid.

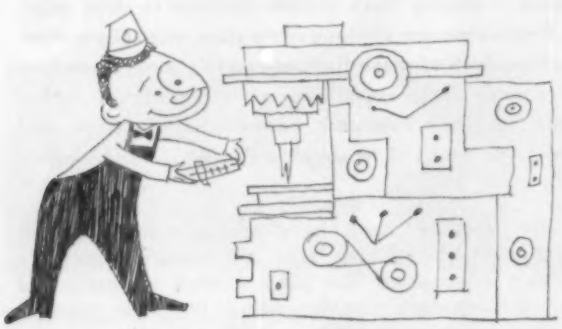
• Metal fabricators can forget preliminary machining in many cases, and can concentrate on their special skills. Almost any plant can benefit by dropping operations that are common to the whole industry and sticking more closely to the details that make its products unique and marketable.

• Precision stock can save a bonus in elapsed fabricating time when emergency tooling has to be built. This is particularly important where high constant production is concerned, or where changeover tooling is involved. Flat, square, high-finish surfaces on the stock can eliminate a lot of fussing and setup that waste time and manpower.

• Fabricators can also bypass or eliminate limited operations that add little to the product. Tube straightening and bar grinding may be dropped, allowing more important operations on the same equipment.

HOW CLOSE IS PRECISION?

Accuracy is always relative, but the constant trend toward tighter tolerances on practically all fabricated metal products is one of the factors that is causing wider use of precision stock. More accu-



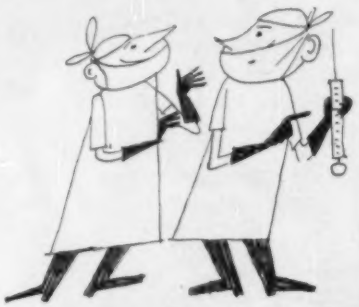
racy in the product demands more accuracy in the tools and fixtures.

Generally the term precision as applied to mill stock means tolerances measured in thousandths—and sometimes tenths. Ground flat stock is dimensioned within a thousandth, plus or minus. Hardened-and-ground dowel pins are accurate within a couple of tenths. Hollow tool-steel bars, on the other hand, may be held only to within five thousandths or more, but are still precision stock because they are relatively close compared to rough mill products.

Steel is the most common tool and die material, and is available in the closest tolerances. But some nonferrous metals can be obtained in special shapes to fairly close dimensions, too. Nickel-alloy tubing, for example, is available with tolerances of plus two thousandths, minus nothing—but this is small-diameter stock. Five thousandths is considered close in aluminum and magnesium. Strip stock and sheet in practically any kind of metal is conventionally rolled to within a very few thousandths, and can be obtained within tenths as well.

WHERE IT'S APPLIED

Most precision stock is either for special-purpose end products—such as hypodermic needles (nickel



tubing)—or for tool and die work, which includes jigs and fixtures. In some few cases precision stock can be applied to the end product—for example, some parts of some machine tools start out as precision stock. Most machines that include mechanisms which must operate within precise limits are potential applications for precision stock, in one shape or another. Sometimes the application might only require carbon steel—perhaps case-hardened; but ground flat stock might fill this particular bill to advantage.

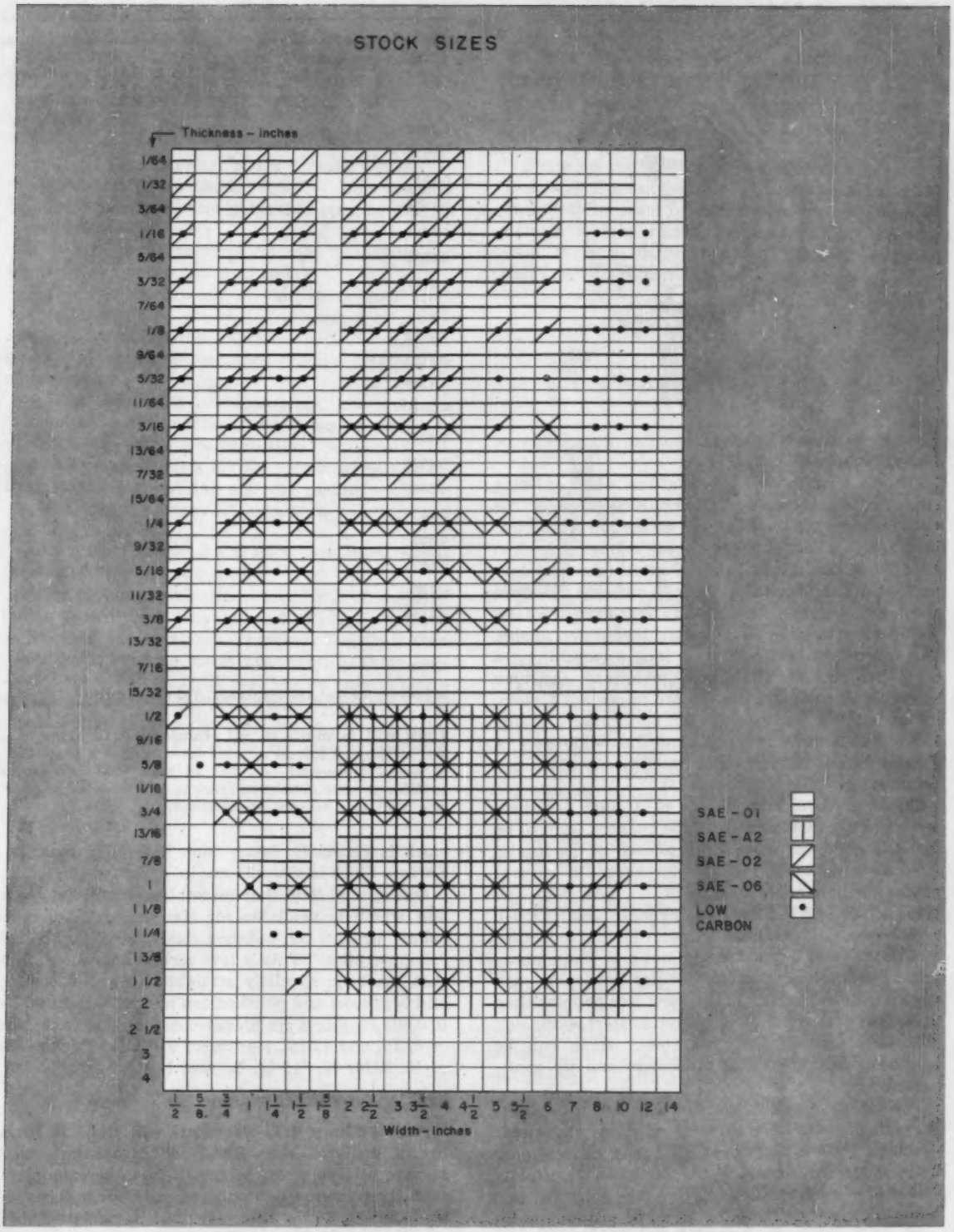
Materials are too often selected on the basis of cost per pound, in which case any precision stock would look expensive. But because fewer operations would be required and less time involved in fabrication, there are many applications in end products that might easily be filled with precision stock instead of rougher, cheaper-per-pound material.

Tooling takes most of the precision stock in common use today, and rightly so. Here the time and labor-saving advantages of high-quality materials make a visible economic saving. Most of the precision stocks in steel are made of tooling grades, which allows making jigs, fixtures, dies, and special tools.

GFS CAN SAVE PLENTY

At nearly twice the price per pound of hot-rolled steel, ground flat stock can only pay off when its greater precision will save time and money. Obviously, because of the increase in sales of ground flat stock, there have been countless cases where closer tolerances have made a difference.

Here's a simple example: To produce a die section 18 x 6 x ½ in. it would be necessary to either pur-



Ground flat stock is readily available . . . almost everywhere, though some distributors may stock only one or two grades. These sizes are fairly standard; others can be ordered if a sufficient quantity is needed

chase a piece of GFS exactly that size (it is a standard size) or buy a hot-rolled slab 18 x 6 x ⅝—to allow for cleanup machining. Both sections cost about the same, but the hot-rolled section can't be

ground for free. Therefore, the flat stock must be less expensive.

Often a shop follows a set pattern when ordering stock for tooling—or any other special purpose. The cheapest kind of steel that will do the job is selected, then the smallest piece that's big enough is picked out. Of course it isn't always more economical to use ground flat stock. It depends on what standard sizes are available; for on many jobs even the GFS would have to be ground or machined down to size, and this might take nearly as long as machining a hot-rolled section. Time, labor, overhead, and time available to complete the job are important factors.

But with the increase in GFS applications, standard-size lists have increased, and the availability of ground flat stock is often as good as any other basic material.

Three fairly common kinds of ground flat stock are currently available—and the chances seem to be that there may be more kinds offered in the future. Oil-hardening steel can be purchased in several grades for general tooling work . . . SAE 0-1—low manganese, SAE 0-2—high manganese, and SAE 0-6—molybdenum graphitic. Air-hardening tool steel—SAE A2—has application in dies and where abrasion resistance is a factor. Water-hardening tool steel is still available, though now less popular than the others because of danger from heat-cracking and distortion. Low-carbon tool steel, which can be case-hardened, has value for fixture and jig applications.

Ground flat stock is usually accurate to ± 0.001 in., though the tolerances are often expressed: + 0.002, – 0.000. Sizes over 1 in. may be held only to ± 0.002 in. Accuracy at the edges is usually + 0.005, – 0.000 in. Lengths are less accurate, and sometimes include an extra ⅝ in. or so to allow for cutting square in the fabricating shop. Lengths are 18 or 36 in., except low-carbon, which is 24 in.

Flatness tolerances are not usually noted, but the

DRILL ROD; FLATS & SQUARES

	←±0.0005→						←±0.001→										←±0.0015→				
	0.0625	0.0937	0.125	0.1406	0.1562	0.1875	0.2187	0.250	0.2812	0.3125	0.3437	0.375	0.406	0.4375	0.500	0.562	0.625	0.687	0.750	0.8125	0.875	1.000
0.0625	x		x			x		x				x		x	x							
0.0937		x	x			x		x		x		x		x								
0.125			x			x		x		x		x		x	x		x		x			x
0.1406				x																		
0.1562					x																	
0.1875						x		x		x		x			x		x		x			x
0.2187							x															
0.250								x		x		x		x	x				x			x
0.2812									x													
0.3125										x		x		x	x				x			x
0.3437											x											
0.375												x		x	x		x		x		x	x
0.406													x									
0.4375														x	x							
0.500															x	x	x		x			x
0.562																x						
0.625																	x				x	x
0.687																		x				
0.750																			x			
0.8125																				x		
0.875																					x	
1.000																						x

In addition, 0.250x1.250 and 0.625x1.125 are available.

Drill rod is made in all standard drill sizes . . . also in flats and squares as noted here. Chart is a combination of several commercial lists, and all these sizes may not be available at same distributor. Stock is same material as round drill rod, made to same specifications

stock is generally flatter than hot-rolled material. Surface finish is often 35 mu in. or better.

One special item that resembles ground flat stock and which is available for similar applications is called "ground and polished steel plate," also called "stripper plate." This is low-carbon hot-rolled steel that has been specially straightened and flattened, and is ground and polished top and bottom to within 0.003 in. Edges are planer-cut. Sizes are in widths of 8, 10, and 12 in., lengths of 6 ft, and thicknesses of ¼, 5/16, ⅜, ½, ⅝, ¾, and 1 in.

DRILL ROD IS THE OLD STANDBY

Any ordinary drill-size chart will stand in for a list of drill-rod sizes. Drill rod is common, well known, and reliable; in fact it is so commonplace that it is often used unnecessarily when cheaper steels might do the same job. But its surface finish, perfect roundness, machinability, and consistent quality make it convenient and easy to work.

Accuracy is almost always ± 0.001 in. on sizes

down to ½ in., ± 0.0005 in. from ½ down to ⅛ in., and ± 0.0003 in. for sizes under ⅛ in. Finish is 35 mu in. or better, and lengths are usually 3 ft, but sometimes 12-ft lengths are stocked, too.

Materials vary somewhat, with several producers stocking more than one grade. These may not all be available from any one distributor, but they illustrate the range of materials in which drill rods are produced:

- Carbon steel—for small tools. Some suppliers have both a commercial and a "special" grade
- W-2 water-hardening steel — for punches, knockout pins, and other parts that must be tougher than carbon-steel parts
- D-2 high-carbon steel for safe hardening and abrasion resistance, as in gages
- O-1 low-manganese oil-hardening tool steel, the most universal grade, for general applications
- A-2 air-hardening tool steel (5% chrome) for deep hardening and jobs that require better wear resistance than O-1
- H-11 chromium-base hot-work tool steel for resistance to heat checking when water-cooled in operation—as some dies are made
- H-13 chrome-moly VV for high wear resistance, used in plastics molding and die casting
- T-1 tungsten-base HSS, easy to machine and resistant to shock
- M-2 molybdenum-base HSS with high toughness and abrasion resistance

These grades are identified here by SAE number, but in many cases they are not exactly the same as the SAE specifications. Producers use their own tradenames, and the steels are made to their own special specification. Drill rod may be only approximately the same as the SAE designation, which the supplier may or may not mention. In any case, the special drill-rod specifications are always available to the customer.

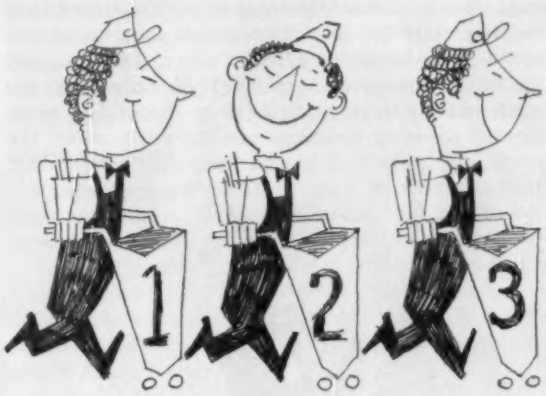
Some of these materials are not universally available, and some of them have a limited number of sizes. Ordinarily, plain carbon steel and oil-hardening steel are stocked in full size ranges, while some of the others may be on the shelf in a smaller range of diameters.

Special sizes are not too difficult to get, at slightly elevated prices. One special drill rod, S-1 chromium tungsten, is made in just a few rectangular sizes for punches and chisels, especially for pneumatic tools.

Square and rectangular drill rod, made to the same specifications, is available in a fairly wide range of sizes. This stock is almost equivalent to small-size ground flat stock, and the result is a wide range of sizes and shapes in precision steel materials.

SHAFTING

Some jig and fixture parts and some elements for tools and dies can be made of carbon-steel shafting; and machine parts or elements of mechanical products can also be made of this material. It's a product with a long history (often called "Cumberland shafting," though many mills produce it).



Precision shafting comes in three general types:

- **Turned and polished**—less expensive, with tolerances of + 0.000, –0.003 to a diameter of 2 in., and + 0.000, – 0.004 on diameters over 2 in. These specifications are rough in all cases; there are minor variations, depending on supplier.
- **Turned, ground, and polished**—with excellent straightness, low internal stress, and tolerances a bit tighter than turned-and-polished stock: + 0.000 for all diameters, – 0.002 up to 2 7/16 in., – 0.003 up to 4 in., and – 0.005 in. up to a 6-in. dia.
- **Drawn, ground, and polished**—to highest accuracy, but including somewhat more internal stress than turned shafting. Tolerances are around ± 0.0005 in. for all diameters from ⅛ in. up to 1½ in.

Stock lengths vary, and may be 10, 12, 16, 20, or 24 ft. Steel grade is not at all standardized throughout the industry. Typical material for **turned and polished** shafting is AISI 1018, while **drawn, ground, and polished** shafting may be AISI B1112, B1113, C1141, C1212, or C1213—or something similar, depending on mill preference.

Turned, ground, and polished steel shafting may be AISI C1018, C1025, C1045, C1141—or, again some similar grade. Largest size ranges in precision shafting are in **turned, ground, and polished** grades; the other two types are available in fewer sizes, although **drawn, ground, and polished** shafting is produced in smaller diameters than the other two types.

One additional kind of shafting material is

special-finish **centerless-ground and polished,** accurate to ± 0.0005 in., and ranging in diameter from about ⅜ to 1¼ in. This may be B1112 or C1212.

These shaft stocks are all carbon steel, and may be applied only where deep hardening is not required. Drill rods usually come in diameters up to 2 in., so if hardened stock over 2 in. is required, the only alternative is tool-steel bars to commercial tolerances . . . except on special order.

Tolerances on most materials get tighter as the sizes get smaller, so small-size stock can sometimes be applied for close work even if the stock is not normally considered a precision product. For example, conventional tolerances on stainless-steel bars for diameters (or dimension across flats on square sections) under about 5/16 in. are ± 0.001 in., and the tolerances spread to ± 0.0025 in. only when the stock gets as thick as 1 15/16 in. Naturally, more careful drawing practices are followed when the stock is a fairly high-priced item such as stainless.

HOLLOW BAR—NOT PRECISE, BUT ECONOMICAL

Hollow tool-steel stock cannot be considered in the "precision" category, but if the stock has to be bored out, hollow bar is so much closer to final size than solid stock that it must be listed. Unlike ordinary steel tubing, hollow tool-steel bar is produced intentionally oversize, both on OD and ID, for cleanup cuts that can be as accurate as necessary for the job. OD's range from 2 to 16 in., and ID's range from 1 to 12 in., each OD with several ID's being available. Machining allowance is about ⅛ in. on ID and OD for sizes up to a 5½ in. OD, and about ¼ in. for larger diameters.

These hollow bars are carried in SAE O-1, W-1, A-2, D-2, D-1, H-13, and carbon-steel (special) grades by several producers. Stock sizes in SAE O-1, for example, are listed below:

OD	ID	OD	ID	OD	ID
2	1	6	3	11	7
2½	1	6½	2½	12	5
2½	1½	7	3	12	6
3	1	7	4	12	7
3	1½	7½	3	12	8
3¼	1¼	7½	3½	13	6
3¼	1½	8	3½	13	7
3½	2	8	5	13	9
4	1½	8½	5¼	14	7
4	2	9	4	14	10
4½	2	9	5	15	9
5	2½	10	4	15	10
5	3	10	5	16	10
5	2	10	6	16	12
5½	2	11	4		
6	2	11	6		

The advantage of hollow tool-steel bar stock over standard steel tubing is, of course, the grade of material, which allows hardening. This stock can be used in tools and dies just as readily as ground flat stock. The advantage over solid tool steel is sometimes enormous because a difficult boring job can be avoided, the customer doesn't pay for internal stock that has to be wasted, and—often most important of all—time is saved.

Sectional die steels are another tool-steel product that should be considered when you're aiming for savings in tool and die work. They cannot be ordered off the shelf, and are thereby different from the other materials under consideration here. But they deserve mention because tool-steel sections can

FOUR EXAMPLES OF HOW PRECISION STOCK PAYS OFF

	Precision Stock	Conventional Stock
1	Ground flat stock: 2 x 4 x 18 in. 40.8 lb @ $1.314/lb $53.64	Hot-rolled bar: (oversize so decarb can be machined away) 2¼ x 5 x 18 in. 57.37 lb @ $.75/lb $43.03 Or 2½ x 4½ in. same weight $43.03
2	Hollow tool steel: 12-in. OD x 5-in. ID x 3 in. 79.44 lb @ $.95/lb $75.47	Solid hot-rolled tool steel: 12 x 3 in. 96.12 lb @ $.79/lb $75.93 (May not clean up at full 12 in.) Forged disk: 12¼ x 3⅛ in. 109.56 lb @ $.79/lb $76.69 Forged ring: 12¼ x 4⅞ (ID) x 3⅛ in. 87.81 lb @ $.90/lb $79.03
3	Drill rod: 36 x 2 in. 32.04 lb @ $1.2994/lb $41.63	Hot-rolled bar: 36 x 2⅛ in. 36.18 lb @ $.70/lb $25.33
4	Special-section "H" 24 in. 41.66 lb @ $.85/lb $35.41	Hot-rolled bar: 24 x 2¼ x 3½ in. 65.46 lb @ $.73.50/lb $48.11

Special stock costs more . . . but can be fabricated more quickly. For example 3, the hot-rolled bar could be machined to the same size as the drill rod, but it might easily cost more than $16.30 in total time, labor, and overhead costs

also save machining and labor costs. They may not save much time, because a given shape may require special rolling, though there are some standard shapes and sizes for which rolls exist—particularly L-shaped sections that may be applied as runners and die sections.

Depending on distributor practice, however, some sectional die steels may be on hand at any given time—most likely in water-hardening grades. Tolerances are not nearly as close as for ground stock, but they compare with tolerances for any rolled sections. Rolled die sections are probably most useful to a fabricator who has continuing need for partly formed sections of tool steel for a product or tool in fairly constant production.

SPECIALTIES FOR ODD JOBS

Whenever close-tolerance material of small size is required there are a number of possibilities. One simple answer to many problems is standard strip stock, which is often quite accurate enough, though not hardenable.

Spring steel can be obtained to close accuracy in sizes from 0.002 in. thick by ¼ in. wide to 0.065 in. thick by 2½ in. wide—many of the sizes in between are ready without special order. This hardened stock is in thickness increments as close together as 0.001 in. in some cases, and the steel may be bright finished or blued.

Reed steel is another coiled product, and goes from 0.0035 in. to 0.0065 in., and is ⅜, 5/16, or ½ in. wide. Hardened gage steel is stocked by some producers and distributors. This is usually ½ in. wide and in thicknesses from 0.001 to 0.070 in., made from high-carbon, low-alloy grades and hardened to around R_c 50.

All of these stocks are made to tolerances measured in tenths, so they easily fall into the "precision" category.

Another possibility is flat cold-rolled steel wire, made in rectangular sections to thickness tolerances as close as five tenths. Up to ¼ in. thickness, tolerances are ± 0.002 in., under 0.0625 in. they are ± 0.0015, and so on down to a thickness of 0.005 in. As with any thin or small-dimension stock, tolerances must get tighter at the smaller end of the size range. Many materials normally considered rough must be held to closer tolerances when the sizes get small, which could easily put the small sizes into the precision category even if the larger sizes are not.

Steel tubing is not normally produced in what might be called precision grades, although cold-drawn seamless mechanical tubing runs like this:

Diameter	*Tolerance*
3/16 to ½ in.	+ 0.004 − 0.000
½ to 1½ in.	+ 0.005 − 0.000
1½ to 3½ in.	+ 0.010 − 0.000

and hydraulic-line tubing, which is low-carbon, cold-drawn seamless tubing is rated thus:

Diameter	*Tolerance*
¼ to ½ in.	± 0.003
½ to 1½ in.	± 0.005
1½ to 3½ in.	± 0.010

Standard cold-drawn seamless tubing is available in much larger sizes, too, but tolerances are proportional to the OD, and therefore wider. Hot-finished and electric-welded steel tubing are both rougher products than the cold-drawn variety. The hydraulic-line tubing is an expensive product because of special handling—plugged ends and oil coating.

STAINLESS STOCK

Partly because stainless steel is fundamentally more expensive than carbon steel, and partly because it is therefore usually applied to special applications, tolerances on some sections and shapes are closer than on equivalent carbon-steel stocks.

Centerless-ground round bars and cold-drawn round and square bars, in stainless steel, are dimensioned fairly closely:

Dimension	*Tolerance*
Up to 5/16 in.	± 0.001 in.
to ½ in.	± 0.0015 in.
to 1 in.	± 0.002 in.
to 1½ in.	± 0.0025 in.
to 4 in.	± 0.003 in.

Cold-drawn stainless hexagons and octagons run about the same, while cold-drawn plates in stainless run about double these tolerances, size for size. Stainless-steel tubing, however, runs a bit less accurate than cold-finished steel tubing.

However, it depends on where you buy your stock. At a specialty tubing plant, stainless-steel tubing in type 304, 321, or 347 grades may be produced to higher accuracy: (usually annealed)

OD size	*OD tolerances*	*ID tolerances*
Up to 3/32 in.	+ 0.002 − 0.000	+ 0.000 − 0.002
to 3/16 in.	+ 0.003 − 0.000	+ 0.000 − 0.003
to ½ in.	+ 0.004 − 0.000	+ 0.000 − 0.004
to 1½ in.	+ 0.005 − 0.000	+ 0.000 − 0.005

And smaller sizes, in special grades, are more accurate. Capillary and hypodermic-needle tubing, although expensive, are possible materials when

something unusual is required. This tubing may be annealed or hard-drawn, usually type 304 stainless. OD sizes range from 0.008 in. to 0.125 in., and wall thicknesses from 0.002 to 0.012 in. Capillary tubing has ID sizes from 0.006 to 0.024 in. Tolerances may be as close as ± 0.00025 in.

Specialty tubing in aluminum, copper, brass, phosphor bronze, nickel silver, cupro-nickel, monel, and inconel are also available from a few mills. Stock of this kind is almost special, though the relatively few companies who make it usually have some quantities on hand. The usual run of sizes is from 0.010 in. to ⅞ in. (OD). Tolerances on brass and copper are a bit closer than on the other metals, but all range from ± 0.002 to ± 0.005 in. Lengths are usually random.

Another non-ferrous specialty item usually carried in stock at some distributing warehouses is aluminum wire and rod. Accuracy is proportional to diameter, as usual, and small sizes are closer than large sizes. In drawn wire up to 0.375 in. OD, tolerance is ± 0.0015 in. or better. Cold-finished rods from 0.375 to 3 in. in dia range in tolerance from ± 0.0015 to 0.004. Larger diameters are rolled to less accurate tolerances.

Rivet wire and rod can be considered a specialty product usually carried in stock in areas where it is constantly purchased. This runs in diameters from 0.061 in. to 0.375 in. as wire, controlled to ± 0.0005 in. Rivet rod starts at 0.375 in. dia and runs to 0.750 in., with tolerances of + 0.002, – 0.001 to ½ in., and + 0.003, – 0.001 to ¾ in.

PRECISION IN LIGHT METALS

Special orders for precision stock in aluminum and magnesium have been a rarity, but in recent years both metals have been produced as close-dimension tooling plates. A fair number of sizes are now available, and this stock is growing rapidly.

Lightness, economy, corrosion resistance, and ease of machining are all good reasons for using the light metals this way, but the important factor is their stability, even after the plates have been partly machined. Tooling plates can be purchased, then fabricated into production and inspection fixtures of reliable accuracy.

Aluminum tooling plates are cast in permanent molds, using an alloy containing 3-4.5% copper, 1-2% silicon, and traces of tin, iron, and titanium that help refine the grain. The plates are aged and stress-relieved, then machined top and bottom to a thickness tolerance of 0.010 in.—but, more important, plates ¾ in. or thicker are held to a flatness of 0.005 in. Finish is around 50 mu in.

Magnesium tooling plates are rolled, then annealflattened and held to tolerances close to those for aluminum. Tolerances for both of these "precision" stocks sound loose in comparison to those for ground flat stock in steel, but there are compensations that help make the light-metal tooling plates valuable in many applications.

Because machining is easy, and because tooling plates are stable through machining operations, cutting the plates to greater accuracy is not difficult when it is required. In addition, both metals cost less than steel of equal dimensions.

Typical dimensions for stock aluminum tooling plate are 48 in. wide, 96, 120, or 144 in. long, and these thicknesses:

⅜ ½ ¾ 1 1¼ 1½ 1¾ 2 2½ 3 4 5

Bar stock is also produced to the same standards, except that the sides and ends are rough-machined; only the top and bottom are flat within the above tolerances. Sizes range from 4 to 8 in. thick, 4 to 12 in. wide, and 6 to 10 ft long.

Magnesium is produced to about the same dimensions, though some stocks may go down to ¼ in. in thickness and to 288 in. in length. Accuracy standards are stated thus: Plate up to 1 in. thick is flat to 0.005 in. in any one ft, and to 0.015 in. in any 3 ft. Stock 1 in. thick and over is flat within 0.010 in one ft and within 0.030 in any 3 ft. This is for FS1W alloy.

Neither light metal is regularly made in other precision shapes, although accurate stock could probably be obtained on special order—at a special price.

Acknowledgement

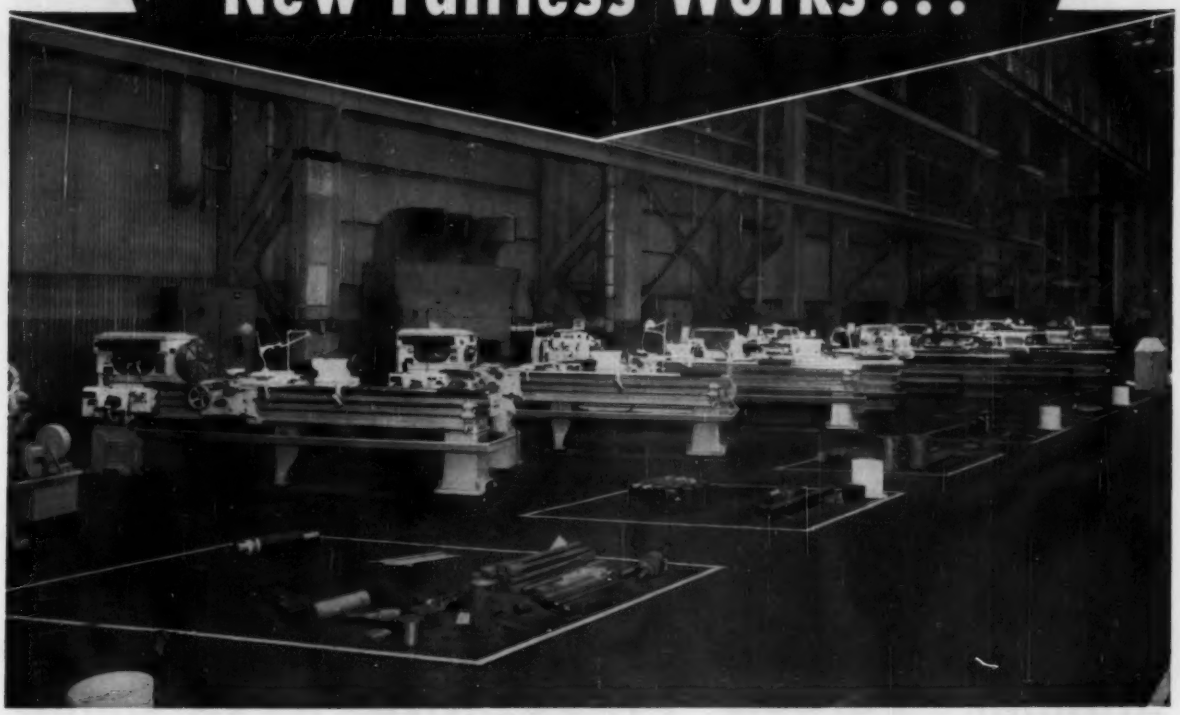
Our sincere thanks go to the following companies for their help in gathering data for this report:

Allegheny Ludlum Steel Corp
Aluminum Co of America
American Brass Co
American Ground Flat Stock Assn
J Bishop & Co
Brown & Sharpe Mfg Co
Bunting Brass & Bronze Co
Capewell Mfg Co
Crucible Steel Co of America
Dow Chemical Co
Firth Sterling, Inc
Peter A Frasse Co
Harvey Aluminum Sales, Inc
Jessop Steel Co
LaSalle Steel Co
Marshall Steel Co
Pittsburgh Tool Steel Wire Co
Precision Tube Co
A R Purdy Co
Red Seal Metals Co
J A Roebling's Sons Corp
Rotary Electric Steel Co
Joseph T Ryerson & Sons, Inc
Simonds Saw & Steel Co
L S Starrett Co
Superior Tube Co
Timken Roller Bearing Co
Uddeholm Co of America
United States Steel Co
Universal Cyclops Steel Co

REPRINTS ARE AVAILABLE
of this and all other
American Machinist
special reports

Send to Reader Service Dept, American Machinist, 330 W 42nd St, New York 36, NY, for list of reprints available and prices. Or enclose, with your request for a specific reprint, 35¢ if it is 16 pages, 30¢ if 12 pages, 25¢ if 8 pages. Prices are reduced for quantities over 100 copies.

13 LEHMANN Engine Lathes NOW at work in U. S. Steel's New Fairless Works...



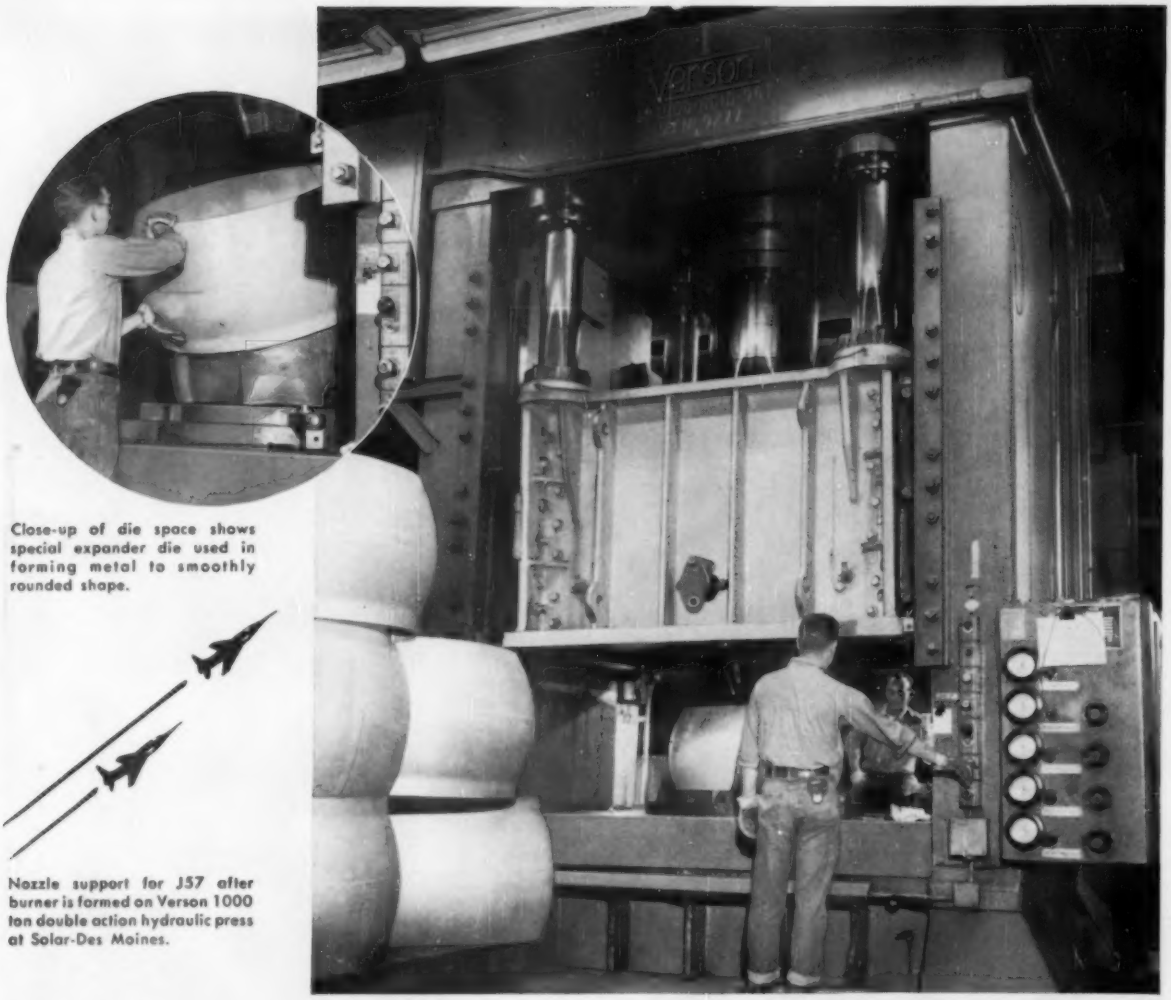
The largest integrated steel mill to be built at one time uses LEHMANN Lathes in its modern maintenance shops!

The Fairless Works, built on 3,900 acres and one of the biggest expansion projects built in our time, incorporates the most modern steel mill equipment available. One of the big jobs at Fairless is that of maintenance. Special shops to keep all the equipment used in this 2.2 million ton plant in top running order are an important part of Fairless.

The machine tools, cranes and other equipment necessary for cleaning, machining and repairing the mill operating equipment (which, in fact, make practically all repairs required at Fairless) include 13 Lehmann engine lathes! Some of these lathes are shown in the above photo.

Find out how Lehmann Lathes can bring efficiency, safety and speed to the operations in your plant. Write today for information or catalog — or — send prints for time and money saving recommendation.

Lehmann · Brandes
MACHINE COMPANY
GRAND at CHOUTEAU · ST. LOUIS 3, MO.



Close-up of die space shows special expander die used in forming metal to smoothly rounded shape.

Nozzle support for J57 after burner is formed on Verson 1000 ton double action hydraulic press at Solar-Des Moines.

Another "Verson" Press proves its versatility

. . . forming jet engine components at Solar Aircraft Company

This is Verson versatility at work . . . a 1000 ton Verson double action hydraulic press . . . "workhorse" at Solar Aircraft Company's Des Moines plant.

Solar produces components for jet and turbo-jet engines which power a number of our best known aircraft. They are also engaged in the manufacture of components for guided missiles. To this end, a variety of tasks are assigned to this Verson Press, including heavy duty expanding, sheet metal embossing and deep drawing. Forming is done primarily with 300 series or 410 stainless steels, ranging in thickness from .031 to .093.

The double action press, largest of its type at Solar-Des Moines, has proved a rugged and versatile production tool. In addition to the heavy jobs, it handles general production when needed.

Big job . . . small job . . . there's a Verson press for you. For specific recommendations send an outline of your requirements.

A Verson Press for every job from 60 tons up.

"Verson" mark

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9316 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

How to Check Squares – I

CHARLES MINAIRE, Chief, Metrology Dept., MANUFRANCE, ST ETIENNE, FRANCE

There are several ways to check squares, with methods varying in speed and accuracy, depending on the results desired. If a master square is available, the working square may be placed against it on an accurate surface plate and the wedge of light visible between them may be merely observed or accurately measured by gage blocks inserted between the master and the end of the vertical arm of the square.

The conventional L-shaped square is not recommended for precision work, because it is actually a metrological anomaly. For the sake of economy, the inside and outside master edges are combined in a single unit, resulting in a weak construction not compatible with precision.

It is much better to separate the two types of squares. The outside square may be a right-angle triangle or a full rectangle (Figs. 1*a* and 1*b*); the inside square in the shape of an L with a heavily reinforced elbow (Fig. 1c). Cylindrical squares (Fig. 2) are by far the strongest and will not deform if accurately made and heat treated.

The two- and three-square methods of checking squares have long been used by draftsmen for checking their squares and are equally effective for shop use.

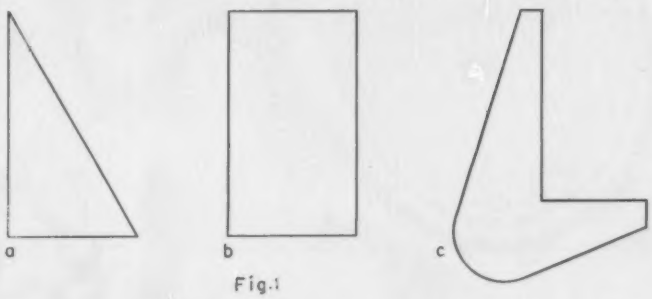


Fig. 1

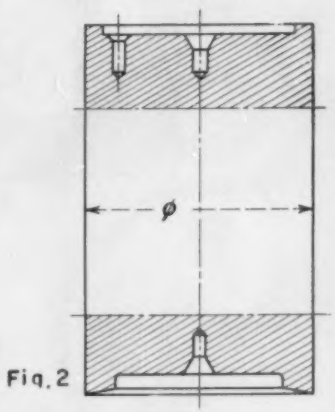


Fig. 2

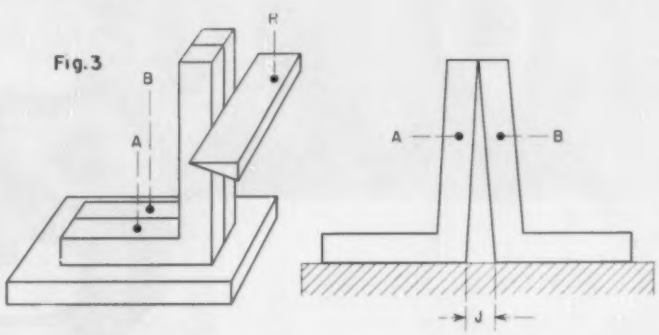


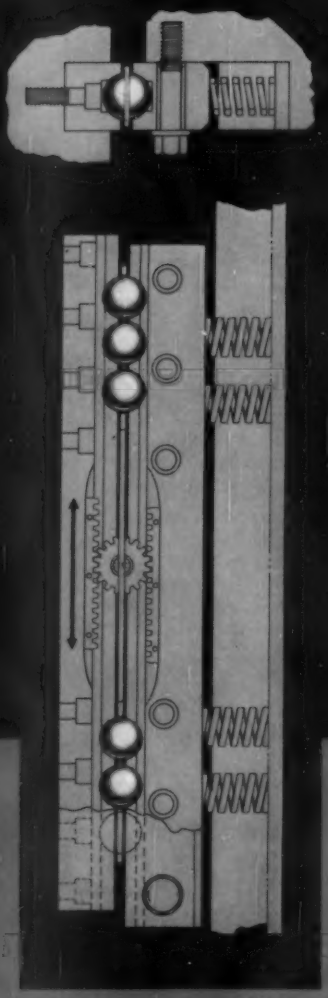
Fig. 3

TWO-SQUARE METHOD (FIG. 3)

Check with a straightedge *R* that *A* and *B*, placed on a surface plate, have the same angle. Then place them back to back and check whether their sum is equal to 180°. Gap *J* will be twice the common error.

PLEASE TURN TO PAGE 165

Only PRECISION Flexopress has Ball Bearing Ram Raceways†



4 sets of pre-loaded ball bearings on "C" and straight side presses (2 sets on smaller "C" types) completely eliminate lateral "float" of the ram.* No lubrication clearance is required. Vertical accuracy is held within .0005" at any point of the stroke. Parallelism between ram face and bed is held to .0005" per foot.

Exclusive spring pre-load is self-adjusting, raceways are bolted securely in place after being located by springs.

*Rule of thumb — ball bearings resist crushing in magnitude of 1000 lbs. per ⅛" in ball diameter. There are 4 raceways in a straight-side Flexopress, each with 6 one-inch balls. Total resistance to lateral thrust — approximately three-quarter million pounds!

the first major advance in press construction in 20 years

The extreme accuracy of the Flexopress ball bearing ram eliminates one of the main causes of die wear (punch striking the die). This means far more production between die grinds. High operating speeds are afforded by the light-weight high-strength construction of the anti-friction ram and the integral feed mechanism — in some cases, up to 600 strokes per minute! Even at these high speeds the Flexopress ram raceways run cool.

Get accuracy, high speed and longer die life for the life-time of your press. Specify Precision Flexopress, the only press with ball bearing ram raceways. Available in "C" types from 15 to 75 Tons, straight side from 30 to 300 Tons. Write today for literature.

† patent applied for.

PRECISION®

3520 Ibsen Avenue, Cincinnati 9, Ohio

PRECISION WELDER AND FLEXOPRESS CORPORATION

Builders of all types of Resistance Welders and Automatic High Speed Presses

How to Check Squares — II

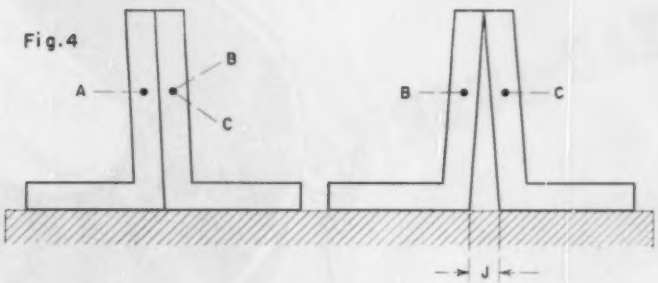


Fig. 4

THREE-SQUARE METHOD (FIG. 4)

Place *B* and *C* back to back. Space *J* represents twice the common error.

LOEWE METHOD

Loewe's apparatus (Fig. 5) is an application of the basic methods discussed. The device consists of a base with a reference surface *P* on which the squares are placed. Checking cylinder *C* is suspended as a pendulum and is adjusted with two screws *V* until the square bears against its edge. By placing the square on the opposite side of the cylinder, the angle 2*E*, or twice the error, can be found.

It might be assumed that optical dividing heads can be used effectively for checking squares. Actually, their accuracy is usually no closer than 10 sec of arc, which corresponds to an initial minimum inaccuracy of 0.0002 in. in 39 in. Thus, this method, in addition to being expensive, is not perfect.

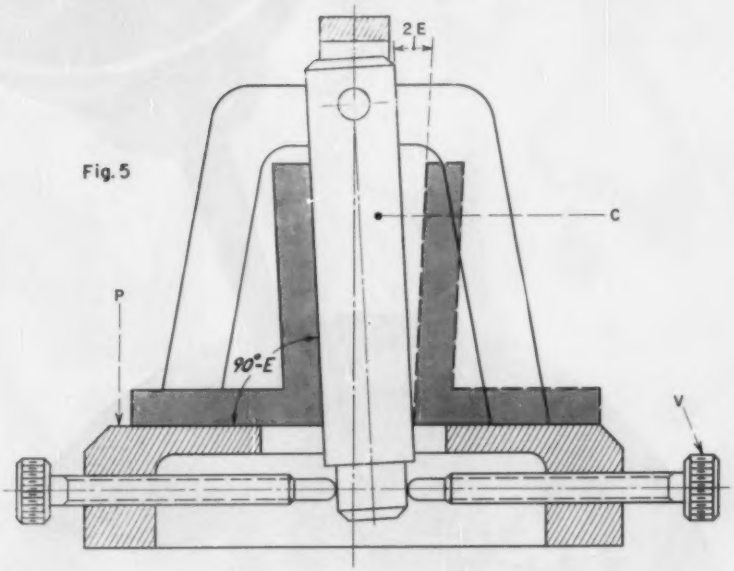


Fig. 5

TO FIND DIRECTION OF ERROR

Without using special equipment, the amount and direction of the error of two squares can be established by measuring the differences between them when they are alternately placed side by side (distance *D*, Fig. 6*a*) and back-to-back (distance *S*, Fig. 6*b*).

To find the amount of error: Error *E* of the square which has the greater difference from 90° is $E = \frac{S + D}{2}$. The error *e* of the other square is: $e = \frac{S - D}{2}$.

Error *e* may be positive or negative. When *e* is positive, and *E* and *e* are in the same direction: The angles of both squares are smaller than 90°, if their sum is less than 180° (Fig. 7) and vice-versa.

When *e* is negative, *E* and *e* are

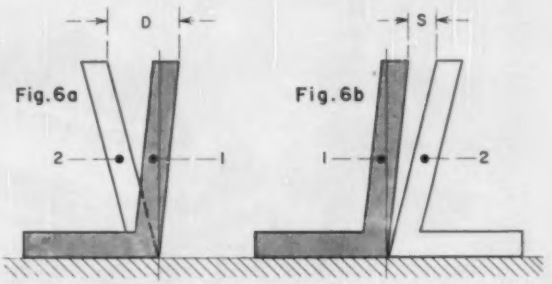


Fig. 6a

Fig. 6b

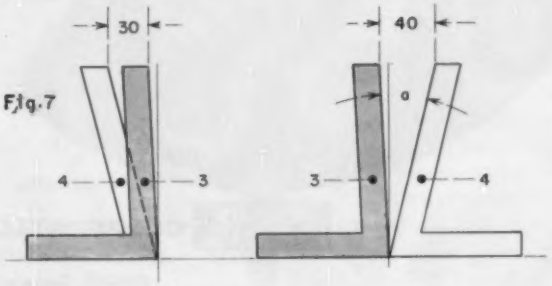


Fig. 7

PLEASE TURN TO PAGE 167

LEAD-LUBRICATED STEELS . . .

FOR "BUILT-IN" PRODUCTIVITY

Lead existing in alloy or carbon steels in the form of sub-microscopic particles acts as a natural lubricant. Its effect on your operating costs will be pleasantly surprising.

Faster speeds, faster feeds, better finish and longer tool life possible with these free machining steels are helping hundreds of manufacturers to increase production and to lower costs.

See what "lubricated" steels can do for you—specify leaded on your next Aristoloy order. Get the cost-cutting benefit of "built-in" productivity.

For further details, write for free booklet, "Lead Treated Steels."

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY • WARREN, OHIO
Steel Division

EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

How to Check Squares — III

in opposite directions: If the sum of the angles is more than 180°, the square with the distance E is the one having the larger angle (5, Fig. 8) and this is therefore larger than 90°.

If the sum of the angles is less than 180°, the square with the distance E is the one with the smaller angle (8, Fig. 9) and this is therefore less than 90°.

Note: If D and S are equal, one of the squares is correct; the other having a distance equal to one of these values can be identified as shown in the table by considering the difference between 180° and the sum of the angles of the two squares.

EXAMPLE I (FIG. 7):

Placed side by side, squares 3 and 4 have a difference D of 30 microns*; back-to-back, the gap S is 40 microns.

* One micron = 1/1,000,000 meter = 1/25,000 in.

Amount of error: $E = \frac{S + D}{2} = \frac{40 + 30}{2} = 35$ microns

$$e = \frac{S - D}{2}$$

$$= \frac{40 - 30}{2} = 5 \text{ microns}$$

Direction of error: e being positive, the two errors are in the same direction. The sum of the angles is less than 180° (by an amount equal to angle a) so both squares are less than 90 deg.

EXAMPLE II (FIG. 8):

In the case of the two squares 5 and 6, $D = 35$ microns and $S = 15$ microns.

$$E = \frac{S + D}{2}$$

$$= \frac{15 + 35}{2} = 25 \text{ microns}$$

$$e = \frac{S - D}{2}$$

$$= \frac{15 - 35}{2} = -10 \text{ microns}$$

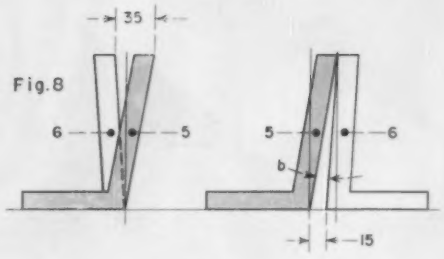


Fig. 8

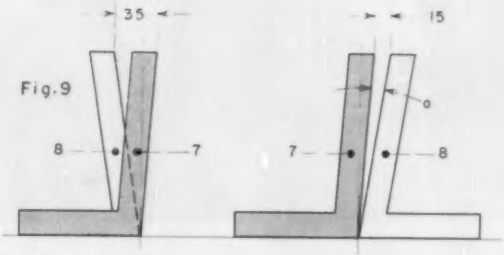


Fig. 9

Values of D and S	*Value of* E	*Value of* e	Direction of error
$D = 0$	$\frac{S}{2}$	$\frac{S}{2}$	Identical
$S = 0$	$\frac{D}{2}$	$\frac{D}{2}$	Opposed
$D > S$	$\frac{S + D}{2}$	$\frac{D - S}{2}$	Opposed
$S > D$	$\frac{S + D}{2}$	$\frac{S - D}{2}$	Identical

Because e is negative, the errors are in opposite directions. The sum of the angles is greater than 180° (by an amount equal to angle b).

The square 5, whose angle is greater than that of 6, has an error of 25 microns; its angle is greater than 90°. The angle of square 6 is smaller than 90° by 10 microns.

EXAMPLE III (FIG. 9):

In the case of the squares 7 and 8, $D = 35$ microns, and $S = 15$ microns.

$$E = \frac{15 + 35}{2}$$

$$= 25 \text{ microns}$$

$$e = \frac{15 - 35}{2}$$

$$= -10 \text{ microns}$$

Here, e is negative. The errors are in opposite directions. The sum of the angles being smaller than 180°, square 8, whose angle is smaller than 7, has an error of 25 microns; its angle is smaller than 90° and consequently the angle of square 7 is greater than 90° by 10 microns.

"Here's a hot one for the slitters

60,000 lbs. of slit coils . . . delivered early tomorrow!"

A TRUE STORY *of Ryerson service—the kind that makes Ryerson your best source for every steel requirement.*

It was ten after five. The phone rang and a steel buyer 80 miles away said: "I've simply got to have 60,000 lbs. of slit coils first thing in the morning."

Impossible?

Not at Ryerson. This kind of service is what Ryerson customers have learned to count on when emergencies arise.

The needed steel was on hand in Ryerson stocks. Unequalled slitting equipment was put to work. And during the night two different gauges of steel coils were slit to meet two size requirements. Early next morning the steel was delivered *as promised* . . . 80 miles away.

You don't have to wait for an emergency to appreciate Ryerson service. Our stocks and processing facilities enable us to meet practically every demand for steel—no matter what the shape, size, quantity or time requirement.

In addition, you can always depend on Ryerson for steel of high uniform quality.

So call your nearby Ryerson plant for steel or help on steel problems with the assurance of close personal attention by specialists who make your problems their own.

In stock: Carbon, alloy and stainless steel—bars, structural, plates, sheet and strip, tubing, re-bars—industrial plastics, machinery & tools, etc.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop...

Coal-burning Diesels

COAL AND OIL have long been competitors as the major source of power for locomotives. Now, thanks to the introduction of nuclear energy, they have become partners. Denver & Rio Grande Western RR has found that low-cost Colorado coal, pulverized to 200 mesh, then exposed to gamma radiation from spent fuel elements at Brookhaven, breaks up into micro-size particles fine enough to float in the air. Adding 5% of this dust to each gallon of fuel oil makes a notable increase in energy content.

Where Ceramics?

SPEED HAS been over-emphasized in talk about ceramics, E B Albrecht told the Purdue conference of tool engineers. He felt that, in turning, ceramics can best be used in these operations:

1. Finish machining, where the maximum depth of cut is 0.060 in. and the primary concerns are surface finish and accuracy.
2. Finish turning of heat-treated parts in the hardness range of 26 to 48 Rockwell C.
3. General turning of light alloys, such as aluminum and brass, that have a low unit shear strength in cutting.
4. Machining of cast-iron parts, providing there are no surface defects, and quality of castings is controlled.
5. Turning of abrasive, non-metallic materials such as nylon, lucite, laminated plastics, and others, where high speeds are necessary to obtain the required surface finish.

Sterling Maintenance

MAINTENANCE OF machinery is a necessity in every industrial operation; however, automation and other modern processing equipment give it paramount importance. At the new Ford plant in Sterling, Mich., requests for maintenance service are sent by a central Telautograph system to sub-stations throughout the plant. This system for transmitting handwritten instructions instantaneously enables dispatching of repair crews to trouble areas within seconds.

Preventive maintenance is also of vital importance. Tool - control boards are found throughout the machining area. These setups tally each operation performed by tools and signal the end of their pre-determined life. Worn tools are immediately replaced by reserve stock stored in the tool control boards.

A unique preventive-maintenance program utilizes Addressograph plates for all critical machinery, listing the routine work to be performed at specific intervals. The plates are run off every day and pertinent information is directed to maintenance superintendents. The result has been fewer emergency breakdowns, a steadier flow of production and lower maintenance costs.

Fearless Fosdic

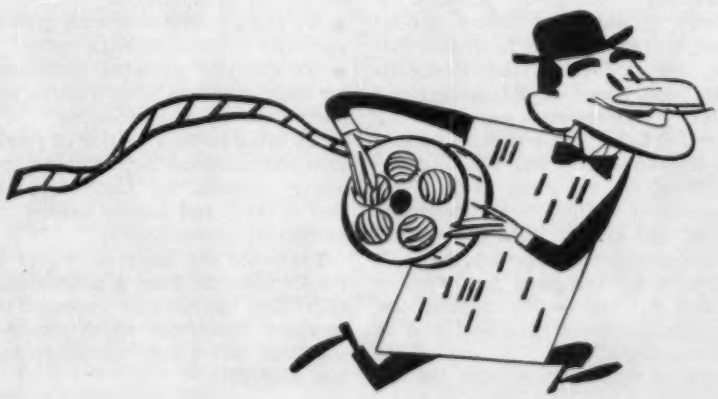
IT WAS PERHAPS inevitable, but a method has been found to reduce punched cards to microfilm and still be able to use them. Card storage may not be a problem *yet* in your plant, but it already is at the Census and Weather Bureaus. So these two agencies now have a pair of cousins, FOSDIC I and FOSDIC II. Fosdic's name comes from Film Optical Scanning device for Input to Computers. (This is a case in which, as with the Navy's WAVES, we suspect the parents of thinking up the initials first and then finding a name that would fit them).

To start with, 13,000 punched cards are transferred to each 100-ft roll of microfilm. The cards can then be tossed away and the film turned over to Fosdic. When you feel the urge to compute, you tell Fosdic what you want to find out. He looks at all the film, selects the card images that seem pertinent and transfers the data back to punched cards ready to feed to a computer.

The next step obviously is to find a method to feed the information directly from Fosdic to the computer, thus eliminating the second card. The step after that is to find a way to transfer the data to microfilm without using punched cards in the first place. Is it possible that the card full of holes, a symbol of the era of automation, is going the way of the whip socket so soon?

Part Finding

OUR AUSTRALASIAN CORRESPONDENT reports an interesting process to separate small machined parts from the chips (or swarf, as they call it). The mixture is placed in a flowing column of liquid with a specific gravity less than that of the metal. The stream speed agitates the mixture and carries the chips along with the stream, but its speed is not great enough to carry the parts, which settle to the bottom.



Connecticut Builds a Fire Under Apprentice Training

I HARRY HYMAN, State Supervisor, U S Dept of Labor, Bureau of Apprenticeship and Training, Hartford, Conn

FRANCIS McGURKIN, Training Director, PRATT & WHITNEY CO, West Hartford, Conn

Back in 1955, *American Machinist* published an article, "Train Diemakers—or Die!" in which five questions were asked of the tool and die industry:

- **Does the tool and die industry need a "committee to build a fire under management?"**
- **How many qualified tool and diemakers will *your* shop have in 10 years?**
- **Tooling will be 50% greater by 1970—how can you meet growing demands with too few craftsmen?**
- **How can you maintain tool quality?**
- **How will America defend itself if its power to tool fast is lost for want of skilled men?**

That article, with its forebodings of a black future for the tool and die industry if it failed to train new craftsmen, started a chain reaction among Connecticut's tool and diemakers that has resulted in a unique and effective statewide apprentice training boom.

The article sparked John D Dewhurst, president of Arrow Tool Co and co-chairman of the National Tool & Die Manufacturers Association's Apprenticeship Committee, into calling together a group of men with similar interests in the future of tool and die apprenticeship: A L Knapp, vice president and general manager of Pratt & Whitney Co's Machinery Division; Richard F Moore, president of Moore Special Tool Co, Bridgeport; Lawrence Eddy, industry consultant, Connecticut Department of Education; and I Harry Hyman, state supervisor for the U S Labor Department's Bureau of Apprenticeship and Training.

"What are we going to do about apprentice training?" Mr Dewhurst asked this group, "How can we develop a dramatic approach that will bring home the need for effective action to prospective apprentices, parents, guidance personnel and to management?"

Out of this meeting came the answer—the First Connecticut Metal Trades Competition. Its objectives:

- To give recognition to outstanding apprentices and to companies conducting effective training programs.
- To alert industry to the need for training to meet present skill shortages and projected needs.
- To improve the quality of training by giving recognition to journeymen and supervisors who, in daily shop routine, do outstanding work in helping apprentices acquire skills.
- To improve the quality of training by stimulating apprentices into making the intensive learning effort needed for qualification as finalists in annual competitions.
- To bring young men with growth potential to management's notice.
- To acquaint potential candidates for apprenticeship with training opportunities in metalworking.
- To bring to the attention of young men and guidance instructors in secondary schools the basic preparation in math and science needed for success in apprenticeship.

These are the basic objectives of the Connecticut Plan, a promotional effort that has not only exceeded its sponsors' hopes, but which provides a pattern which other areas can follow profitably.

To achieve these objectives, a planning committee developed test material, examination procedures, and judging techniques. The members of this committee had to meet problems of securing broad participation, holding written examinations, judging work performance, getting adequate publicity, selecting and awarding prizes, holding recognition ceremonies, etc. Some of the procedures:

- Announcement of the competition in local newspapers.
- Two special bulletins on the apprentice competition were sent to 1600 firms on the mailing list of the Manufacturers' Association of Connecticut, and two other special bulletins went to members of the Central Connecticut Tool and Die Association, and the Southern Connecticut Tool and Die Manufacturers Association.
- The Connecticut Chapter of the American Society of Training Directors sent a special letter announcing the competition to its members.
- The State Department of Education sent special letters to all personnel teaching apprentice-related classes in the metalworking trades.

Top Firms Participate

In addition to the contract tool shops and locally known manufacturing firms, some nationally known concerns entered apprentices: General Electric, Lux Clock, Waterbury Mfg Co Division of Chase Brass & Copper, Singer Mfg Co, Pratt & Whitney Co, Farrel-Birmingham Co, Scoville Mfg Co, Veeder-Root Co, Royal Typewriter Division of Royal McBee Corp, Stanley Works, Fafnir Bearing Co, Olin-Mathieson Co, Bullard Co, and Pitney-Bowes, Inc.

Field contacts by U S Department of Labor and State apprenticeship representatives aided in publicizing the competition, which has eligibility rules limiting candidates to apprentices who have completed between 6000 and 8500 hours of training in designated trades. Apprentice nomination forms were mailed with

the special bulletins and announcements.

Under the supervision of the State Department of Education, all eligible candidates were given a six-hour written examination in basic math, science and trade theory. Eighty-three apprentices took the examination and the top 27 were designated as finalists, eligible for the work performance test.

This test, which counted for 70% on the total score, compared with 30% for the written test, involved visits by teams of three judges to the plants where the apprentices worked.

Eight of these teams, made up of men with long experience in the metalworking trades, were given instruction on scoring, which was done on judging cards prepared by the contest committee.

All finalists were given copies of the *New American Machinist Handbook*. The top six apprentices were given special tool prizes and, along with representatives of companies in which they trained, received appropriate certificates. Six additional apprentices were given honorable mention and the book, *"Holes, Contours and Surfaces"* by Richard F Moore and Frederick C Victory. Awards were made at the 1956 convention of the National Tool & Die Manufacturers Association in Hartford.

Practical judging of a finalist . . .

Thomas Sawrun, apprentice and finalist in last year's Connecticut Metal Trades Apprentice Contest, has his work judged in an on-the-spot practical test by (left to right) judges Edward Stepeck of Vinal Technical School; Herman Telke of Elmwood Tool Co; Walter Daubitz of Oxford Tool Co, and John Dewhurst of Arrow Tool Co, vice chairman of NTDMA's Apprentice Training Committee

The formal recognition given to apprentices doing outstanding work provided an incentive for them to live up to this recognition. It also spotlighted for management personnel with potential for further development. This has already resulted in promotions for a substantial number of the finalists.

The special bulletins mailed by the sponsors, together with the widespread newspaper, plant house organ, and television coverage given the contest, focused the attention of all levels of management on apprentice training programs, or lack of them. A number of companies which had no eligible participants for the 1956 competition have taken steps to assure participation in future competitions.

The judging procedures used in the competition and the certificates to companies with outstanding apprentices made possible contact with, and recognition for, department personnel directly involved in training apprentices. This has stimulated greater interest in the instruction of apprentices at the job level. The importance of this factor cannot be overestimated, because only when willing and able apprentices have their job opportunities and instruction planned by interested foremen and journeymen can the full potential of apprentice training be realized.

Apprentices eligible for future competition are working harder in the classrooms and on the job to acquire the information and proficiencies needed to qualify as successful contestants. And instructors in the various schools providing related instruction have sharpened up their programs, so that students can stand a better chance of reaching the finals in future competitions. A similar sharpening of job training practices has also taken place.

Publicity given the competition provided a medium for reaching and acquainting the general public, prospective apprentices, school instructors and guidance personnel with the opportunities, the aptitudes and the basic secondary school training needed for successful apprenticeship in the metalworking trades.

After the competition, the committee carried out a study to obtain information on the age, work and educational background, and attitude of the 27 apprentices who had qualified as finalists.

Each apprentice, interviewed at the plant where he worked, was asked not only to answer specific, factual questions, but also to discuss freely: the quality of his training, problems which affected his on-the-job training and instruction, ways he used to meet these problems, how personal relationships in the department affected his training.

Ages Vary Widely

There was wide age range among apprentices who qualified as finalists. The youngest was 17 when he began his training, while the oldest was 28. The average starting age was 22.5 years. The completion range was from 20 years to 32 years, with the average at 26.2.

But, the report says, because of the policy of many concerns of limiting apprentice applicants to a range of 18 to 21 years, the large number

of successful apprentices in the higher age range may indicate a need to re-examine this policy.

Seven of the 27 finalists were married when they started training. They had from 1 to 3 dependents. Sixteen of the group were married before completion of their apprenticeship. They had from 1 to 4 dependents.

These statistics indicate that for this group marriage was not a deterrent either to entering or continuing apprentice training. Individuals with family responsibility were willing to make financial sacrifices to acquire an investment in skill. The success of this group shows that it had a serious attitude toward learning the ability to meet family responsibilities.

The oldest starting apprentice (married, age 28) shifted from a grinding job to apprenticeship. This involved a $1.06-per-hour wage reduction. Upon completing his training successfully, he said, "It was the best decision I ever made."

In general, the wives of these apprentices supported their husbands' decision to become skilled craftsmen.

Why They Become Apprentices

The reasons given most frequently by apprentices for entering the trade were: (1) "like to do mechanical work," (2) "better wages of craftsmen," (3) "job security of craftsmen," (4) "opportunities for advancement to positions of greater responsibility and earnings."

While most apprentices considered only items 1, 2, and 3 at the time they started training, a majority indicated at the time they were interviewed that opportunity for advancement was the most important reason for acquiring the trade.

Apprentices indicated the important influences guiding them into the trades were: influence of parents —7 apprentices; advice by fellow workers or supervisors—7; vocational school instructors—5; self-motivated—6; vocational guidance (secondary school)—1; and "Career Day" —1.

Because only one of the 27 apprentices was influenced to enter apprenticeship by vocational guidance in high schools emphasizes the need to alert vocational counselors to the opportunities arising out of apprentice training.

In 21 cases, the family attitude toward serving an apprenticeship was favorable and encouraging. In six cases there was a negative attitude, and in all but one of these cases the family attitude remained negative during the apprenticeship.

In 17 cases, apprentices would have liked to go on to school, but had not been able to do so for a variety of reasons, chiefly financial. In 10 cases the apprentices were interested in going directly into mechanical work.

Twenty-two apprentices had work records prior to entering training. Of these, 12 had jobs requiring operation of machines and use of tools. In 10 cases the jobs did not relate to mechanical trades. These included store clerks, shipping clerks, material handlers, etc. Five apprentices had no work record before starting training.

The study showed that 18 apprentices had more than 2 years of math; 11 had 2 years of science (including one year of either physics or chemistry); and 16 apprentices had more than one year of industrial arts. This would indicate that a majority of the finalists had acquired some of the math, science, and mechanical background applicable to their trade before beginning their apprenticeship. The school grades for the group averaged fair to good. There were no cases of school failure.

Some Take Correspondence Courses

After secondary school, 13 of the apprentices had taken courses by correspondence course or in the Armed Forces. Three had attended college.

Sixteen apprentices reported their shop training as being "very good"; eleven rated their training as "satisfactory"; no "unsatisfactory" situations were indicated. However, in 21 cases the apprentices indicated that the training could be improved.

Among the suggestions as to how this could be done were:

- Reduce the amount of repetitive work.
- Assign instruction responsibility to a journeyman who has the time, the willingness, and the ability to help the apprentice learn.
- Wider job experience.
- Greater responsibility and opportunity to carry out a job.
- More opportunity to discuss a job with supervisors, so that understanding is developed. Organized and periodic discussion among apprentices on job problems and as to what they are learning.
- More interest by foreman to encourage reading of such information sources as machinists' handbooks, manufacturers' literature and trade magazines.

Seek Worker Acceptance

In almost all cases, apprentices indicated that the first and most important problem they faced was getting favorable acceptance by the work group in general, as well as by the foreman and key journeymen. They said this acceptance was necessary if advice, instruction and information was to be obtained from the foremen and the journeymen whose experience and knowledge they desired to share. Some of the answers to the question on how this could be done were:

- "Ask questions about the work."
- "Be respectful and show appreciation for answers."
- "Never embarrass a journeyman. Use great discretion in checking his answers if you feel his advice is wrong."
- "Use initiative in solving problems. Learn where to find information so that you don't ask questions on things you can find out for yourself."
- "Keep a notebook and write down the answers to questions and the ways of meeting job problems. Journeymen are impressed when they see their comments given this kind of attention."
- "Try to get advice from the best journeymen. Don't blame a journeyman for mistakes."
- "If you are having difficulty with your training, talk the problem out with the foreman. Sulking only aggravates the situation."
- "Don't be afraid to think and make suggestions on jobs."
- "Apply the theory and information you get from reading, classroom instruction and discussion with journeymen and apprentices to your work situations."
- "Don't 'gold brick.' You have to show that you are willing to work and want to learn to get cooperation and instruction."
- "Buy good tools."

In all cases, apprentices reported that they were able to get good cooperation from most of the journeymen.

Regarding related instruction, 20

of the 27 apprentices took four hours a week under the state vocational education system. One apprentice took nine hours a week at Bridgeport Engineering Institute; two took eight hours a week at state vocational schools, and two others six hours a week. One took a three-hour-a-week correspondence course.

A majority of the apprentices attending four-hours-per-week courses at various Vocational Schools said that the related courses could be improved. Among the suggestions they made were: "more homogeneous grouping," "more mathematics, both shop application and theory," "more intense classroom instruction," "good course in physics," "good course in basic electricity," "instructors don't extend students—more challenging and advanced subject matter needed," and "home reading assignments and long range projects involving solutions of problems should be part of the course."

CONNECTICUT METAL WORKING TRADES

Outstanding Apprentice Award
1956

This Certificate is presented to

in recognition of his selection as one of the six outstanding Fourth-year Apprentices in the State-wide Metal Working Trades Apprentice Competition.

Competition Sponsors

CONNECTICUT STATE DEPARTMENT OF EDUCATION
BUREAU OF APPRENTICESHIP, U. S. DEPARTMENT OF LABOR
MANUFACTURERS ASSOCIATION OF CONNECTICUT
CENTRAL CONNECTICUT TOOL AND DIE ASSOCIATION
SOUTHERN CONNECTICUT TOOL AND DIE ASSOCIATION

Chairman, Competition Committee

What About Home Study?

Only six of the 27 apprentices indicated that they had home study as part of the related course. However, 22 indicated that some home study should have been included and only five said that they did not think home study necessary.

The study showed the need for continuing evaluation of the related program—and that raising the standards and requirements would be welcomed by many apprentices.

While suggestions on improvement were made by a majority of the apprentices covered in the survey, all of the apprentices indicated they had benefited substantially from the related training program.

Twenty-three of the 27 apprentices surveyed indicated that they hoped to go beyond journeyman status. Their objectives included foreman, tool designer, mechanical engineer, and general supervisor.

This indicates that careful selection and training of apprentices who have real potential need to be matched by opportunities for their further growth and advancement in the company providing the training. Several apprentices felt that there were no opportunities in their present organization and were planning to seek opportunities elsewhere.

Educational background, previous work experience, interview, and testing were the chief factors used in selection. Twenty-one of the 27 apprentices took aptitude tests. Ten of these tests were given by the State Employment Service, 11 were other standard tests. Several companies required previous work records with the company before acceptance as apprentices.

Twelve companies reported that apprentices received supplementary training. This included in-plant classes, lectures, films, engineering-level courses in outside schools, supervised reading assignments and discussion with supervisors.

All apprentices and companies reported that the competition had provided a real stimulus to training. "It got recognition of the apprenticeship program and greater cooperation from supervisors, journeymen, related instructors, and apprentices." "It emphasized the quality of training."

Several apprentices indicated that the competition could be improved by giving more recognition to the differences between trades. Several apprentices also indicated that all finalists should be invited to a dinner celebration.

This study revealed that Mr Average Finalist entered the trade at age 22.5; had completed high school with fair to good grades; had taken 2.5 years of math; 2 years of science (including one year of either physics or chemistry); had worked at one or more jobs before entering apprenticeship; and had showed above-average ability on a standard aptitude test.

He is anxious to establish a secure position which has some status and which offers him a better-than-average chance for advancement. He is willing to make some sacrifice of present earning power to acquire the skill and knowledge which would make these goals possible. His family encourages him in these aims.

He knows how to get along with his fellow workers and supervisors. He enlists their cooperation in his training by showing qualities of tact, industry, initiative and appreciation. As his knowledge and skill grow, his horizons broaden and he seeks to increase his abilities by study and extra effort so that he can qualify eventually for a job with supervisory or engineering responsibility.

Announcement of the Second Annual Connecticut Metal Working Trades Apprentice Competition has already been made. Approximately 200 apprentices in their fourth year of training are expected to compete. The Chicago area has announced its first annual competition and is using the testing material and procedures developed in Connecticut. Other tool centers which have requested advice and material include Cleveland, Fort Worth, New York and Philadelphia.

The 1955 *American Machinist* article asked the question "Does the tool and die industry need a 'Committee to Build a Fire Under Management'?" In Connecticut we feel that the fire has been lit. If other areas will pluck a brand from this fire by holding similar apprentice competitions, the result will be more and better training for skills vital to our national security and economic welfare.

Cutting Back Machine Tool Costs

Makers' Engineering Reappraisals Save Buyer Money

WASHINGTON — Engineering appraisal of a machine tool after a model has been introduced and put into production can save as much as 15% in direct labor costs involved in building subsequent units. Not only that, another searching engineering look after a model has been in production a few years can save up to 15% more in labor costs.

That is one of several management facts brought out in a panel discussion on coordination between machine tool engineering and production held here during a meeting of the National Machine Tool Builders' Association. The opinion that engineering reappraisals could cut labor costs drastically was expressed by Harold S Sizer, director of design for the Machine Tool Division of Brown & Sharpe Mfg Co, who was a panel member along with Charles B DeVlieg, president of DeVlieg Machine Co; Edward M Dowd, executive vice president of Lapointe Machine Tool Co; and Harry C Soukup, works manager, Giddings & Lewis Machine Tool Co. Panel moderator was M A Hollengreen, president of the Landis Tool Co.

The discussion concerned ways to reduce costs by increasing coordination between engineering and production departments. As an example of what may happen when coordination is lacking, Mr Soukup related an experience that involved a 100-x-10-ft runway for a machine tool. It was too long to fit on a 44-ft planer, and too heavy to be lifted by the shop crane. To split the load, the runway was divided into four 25-ton sections; and it was only after sections had been cast that it was realized four planer setups would be necessary. If the runway had been split into five 20-ton sections, three planer setups could have been made by doubling up sections two at a time.

Another example, showing what happens when coordination is left to memory and is not necessarily a part of the planning system, was related by Mr Sizer. A stylist decided to update the design of handwheels on a machine tool. But customers complained that the new design was not easy to work with. The stylist understood the problem, and the wheels were changed back. After a few years a new designer made a similar change, with the same result. The company fell into the same trap twice because of a lack of engineering-production coordination.

Mr Sizer also remarked that, while appearance is important for machine tools, practical considerations must come first. He said a cost-reduction program can get your break-even point down, and that builders should give the shop a chance to look over designs in the early layout stages.

Mr Soukup was of the opinion that the drawing is the absolute bible; it is the responsibility of Engineering to make complete drawings that should not be subject to question or interpretation.

Mr DeVlieg suggested that the industry is a contest of engineers, and the starting point in engineering is a proper field analysis to better decide what kind of race you want to get into. He stated that his company designs into the equipment that it has. He also noted that Henry Ford had demonstrated that you can make money on "repeating your engineering," and that any machine-tool activity can experience pronounced economies in close relation to the effort put forth to repeat its engineering. He said the areas of flat surfaces and bored holes are those in which the greatest study and gains can be made in general practice in the machine-tool industry.

Mr Dowd said his company has regular productivity meetings in which Engineering can discuss with shop people all the things currently being put into the shop. These are attended by Management, supervisors, engineers, and workmen.

On the tendency for a shop to demand more and more from its engineering department, Mr Dowd suggested that the whole machine-tool industry is selling engineering. The answer to higher demands is a larger engineering department and more engineers.

Mr Soukup pointed out that most machine-tool plants are not so large that communication between the shop and engineering is difficult; therefore, engineering should know what is available in the shop for doing the work required. Mr DeVlieg noted that a new machine tool in a small shop is an event, so everyone knows about it.

Mr DeVlieg reported an unusual designing approach in his company. Designers make the details, keeping in mind some few major centerlines and overall general dimensions that should be remembered. They have the experience and judgment necessary to design small parts and units for best production. Detailers take these units and assemble them, which produces fewer errors.

One major cause of trouble between engineering and production departments, noted by Mr Dowd, is that after a design has been changed and the drawings have been changed, the fixtures are often forgotten. In many cases the redesigned part cannot be properly produced in the old fixtures.

Customers come to the machine-tool plant to inspect machines when they are about ready for shipment. In some cases this causes a considerable amount of confusion. Mr Dowd reported that a company he visited charged $75 a day as a "hanging-around" fee, after three days.

Asked about scraped ways, Mr Sizer said that good cooperation was required between engineering and production to allow ground way surfaces, but they are much preferred. Usual practice is to allow some ground, and some scraped surfaces.

Mr Soukup reported his company's method of scheduling engineering work to tie in with production work. If a delivery promise is made, they work backwards. Assembly time, production time, procurement time, and engineering time are allocated. If engineering cannot deliver by this date, found by backward projection, then some adjustment on delivery time must be made. If no adjustment can be made, then engineering must do something, such as add more men, or work overtime.

On cooperation between engineering and production personnel, Mr Sizer reported experiments his company has made in having a production man always available to engineering. He can be asked what is the best way to produce a given part, or may volunteer an opinion.

What Could Happen to Your Plant in War?

New ODM Center Calculates Industry Survival Pattern

WASHINGTON — The government has set up a National Damage Assessment Center to study potential damage to key industrial facilities under varying attack assumptions in a future war. The Center is located at a secret site, operates under the direction of Office of Defense Mobilization with personnel from 14 federal agencies.

Details on the Center's operation are revealed for the first time in an ODM report to the Joint Congressional Committee on Defense Production, it's titled *"Reducing our Vulnerability to Attack."*

Purpose of the Center is to compute in advance the overall physical damage, radiological contamination, and casualties that could be assumed from enemy air attacks on major U S targets under varied assumptions of types of bombs, height or type of burst, and the like.

Data on 150,000 Plants

The Center has recorded on electric computer tapes detailed information—physical vulnerability, strategic importance, etc—on some 150,000 industrial plants, public utilities, military bases, and other major installations.

As part of its operation, the Damage Assessment Center is also working up a series of "general vulnerability" and "survival probability" indices for key installations. The objective is to determine in advance the "risk of loss" applying to such installations under various hypothetical enemy attacks.

Non-Military Defense

The ODM report stresses that industrial defense measures supplement military forces as a deterrent to enemy attack. "Non-military defense . . . discourages attack by reducing the likelihood of its being sufficiently effective to destroy us," the report says. "Non-military defense is a dual defense—it both reduces the chances of attack and increases the chances of survival if attacked."

The report summarizes the latest federal and industry action in such non-military defense areas as plant dispersion, emergency relocation of industry and government, protective construction, and emergency management plans.

Some important disclosures:

• Military representatives are visiting key defense plants annually to "survey . . . and assist management in assessing the security status of the plant." Participation in the program is voluntary; the government doesn't pick up the costs for carrying out recommendations for reducing plant vulnerability. But "the surveys show a measurable increase in management recognition and awareness of the need for planning and continuous action to improve security conditions."

• In the past five years, ODM has turned down 67 fast tax writeoff applications for plant expansion worth $1.4 billion for "refusal to meet (plant dispersal) standards and inability to justify exception." This is 7.7% of plant expansion projects covered by dispersion criteria under the fast writeoff program. Companies cited favorably for making dispersion a key element in site selection are General Electric, The Martin Co, United Aircraft, Minneapolis-Honeywell, and Lockheed Aircraft.

• As part of the Pentagon's drive to broaden the mobilization base and develop multiple sources of supply, 179 contracts were awarded in the past two years for major military hardware to new producers of an item. This is out of a total of 762 contracts worth more than $10,000 each granted during this period for procurement of top-priority equipment. Four contracts involved price differentials to bring new producers in.

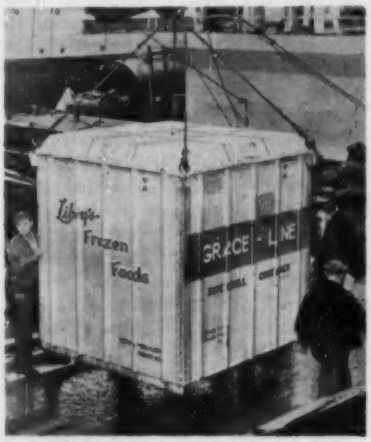
The ODM report shows that 50% of "essential defense industry"—metals, chemicals, machinery, fuels, and the like—is concentrated in the 17 largest U S cities, according to latest figures. Included in this is 54.6% of the output of fabricated metals, 42.6% of non-electrical machinery, and 54.2% of transportation equipment.

Defense Concentration in Cities

In the 57 major cities, 71.3% of essential defense production is centered. This includes 72.7% of fabricated metals, 66.9% of non-electrical machinery, and 80% of transportation equipment.

Conceding in an understatement that "this is a high degree of industrial concentration," the ODM report places a novel interpretation on the figures. It says: "When it is recognized that the Soviet Union's entire industrial production is only about 30% of ours, and that 29% of our essential production is outside the 57 largest cities, our relative position is still a good one."

The report then backtracks a bit, says "These percentages vary among different types of production; our problem is one of protecting certain vital elements of our overall industrial economy, and beyond that working towards a balanced segment of our total industry in dispersed locations so that our economy could continue functioning at a lower level after massive attack."



Alcoa Comes Up With "Containerization"

By 1960, your furniture and household belongings may be canned in aluminum containers like this one for moving from place to place. It's all part of the new principle of "containerization," in which huge commercial shipments, machines and equipment can be moved in standardized containers. Advantages, says Alcoa, are: reduced packing costs, less damage and chance of pilferage, a cutback in time and labor needed to load and unload carriers, less contamination

Aluminum Gains in Auto Usage

ATLANTIC CITY—Experience with and prospects for aluminum use in automobile production are brighter than ever according to the discussion at the summer meeting of the Society of Automotive Engineers held here June 2 to 7.

In trim applications, aluminum is not for full bright use in competition with chrome, according to G M Haviland of Fisher Body, but it lends itself to other finishes. Cost is still the major element in determining whether to use aluminum, but it can't be measured on material cost or processing cost alone.

Cold-forged aluminum anodized crests cost more than chrome-plated zinc die castings and involve a considerably higher tool cost. But the service cost is less, because the chrome plate breaks down in deep recesses, and this more than offsets the initial cost.

Fred Mason of Chrysler said that despite a raw material cost about six times that of cast iron, with a weight saving of only 3 to 1, good design can increase the weight saving to 4 or 5 to 1. Cast aluminum is similar to cast iron in physical properties, but there is no penalty for intricacy in aluminum castings.

Experience with aluminum in the European auto industry was reported by Fernand Picard, president of the Societe des Ingenieurs de l'Automobile. The problem of seating ball and roller bearings in cast aluminum housings is now being solved by putting a coating of nylon on the outer cage of the bearing. The high expansion rate of the nylon makes up the difference in expansion rates of the steel and aluminum.

Mr Picard reported excellent experience with aluminum in structural parts, though he warned that if the engine was too long there was a tendency for aluminum heads to cause cracking of exhaust manifolds. He reported less satisfactory experience with body panels and trim, and lively discussion developed over the experiences he related. These included difficulty in repairing aluminum panels bumped in an accident, tearing of metal around spotwelds, and difficulty with paint adhesion.

The metal tears seemed to result from an attempt to use too thin a section for the application. Mr Mason reminded the engineers that one slip of the designer's pencil can run through the entire gamut of the physical properties of a material. He also cautioned that when you are working with an unfamiliar material and run into trouble it is awfully easy to change to a material you are familiar with rather than to solve your problems by finding out how to handle the new material properly.

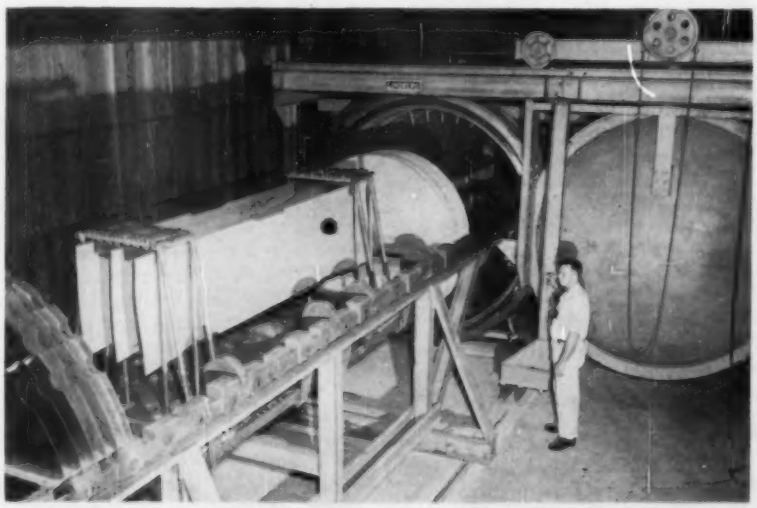
It was pointed out that there is no difficulty with paint adhesion on aluminum when the proper primer is selected.

Floturn Progress

In reviewing the progress with the Floturn spinning method (*AM*—Mar 29 '54, p104) C L Sporck and W H Busch of Lodge & Shipley said that most of the current application was in jet, missile, and ordnance equipment. However, they said that equipment would soon be on the market that would produce at the rates required by competitive industries, and suggested that the method would be applicable to auto parts by the 1959 or 1960 models. Floturning is already being used on utensils, and in other industrial fields.

As an illustration of the tolerances that are now being held, the side wall of a motor tube is being held to 0.035 ± 0.001 in. This establishes the weight tolerance of the part. Previously it had not been possible to hold the weight tolerance this close because of the difficulty in obtaining sheet consistently held within a tolerance of ± 0.001 in.

To fill the vacancy resulting from the death of the late Dexter Kimball, Jr, the SAE Council elected J E Adams, vice president, White Motor Co, to serve as vice president of SAE heading the production activity. Anderson Ashburn, managing editor, *American Machinist*, was selected for Mr Adams' former post as meetings vice chairman of the production activity. Charles W Ohly, general manager of Thompson Products' Michigan Division, continues as membership vice chairman of the activity. The next National Production Meeting of SAE will be held in Chicago next Mar 31 to Apr 2.



Largest Heat-Treating Vacuum Furnace

. . . is now processing titanium parts for the Navaho intercontinental guided missile at North American Aviation's Missile Development Division, Downey, Calif. Parts are rolled inside the furnace on rails, where they are subjected to temperatures up to 2100 F and vacuum down to 0.3 microns. This, says North American, is the first time that full-size flat sheets of Ti can be wheeled into a vacuum furnace for annealing. The 1400-cu-ft furnace, made by F J Stokes Co, can be evaculated to 0.3 microns in less than 23 minutes

AGMA'S NEW PRESIDENT
LeRoy R Brooks
President
Tool Steel Gear & Pinion Co

VICE PRESIDENT
Ervin F Borisch
Executive Vice President
Milwaukee Gear Co

TREASURER
John L Buehler
President
Indiana Gear Works, Inc

"No Time for Obsolete Defense Thinking"

U S Needs Alert Military-Industry Team, Gearmakers Told

HOT SPRINGS Va—The onrush of technological developments, which has created more material progress the past 20 years than in the previous 2000, has made more necessary than ever before that military preparedness and industrial readiness go hand in hand, J Lewis Powell, Office of Assistant Secretary of Defense, told members of the American Gear Manufacturers Association at their 41st annual meeting at The Homestead June 3 to 5.

The meeting was the most heavily attended in the association's history. It consisted, as usual, of general sessions and committee meetings. Gunnar E Gunderson, Brad Foote Gear Works Inc, association president, presided at the general sessions and at the banquet. Two papers were presented, one on "Precise Formulas for Over-Pin Measurements of Helical Forms" by S J Johnson and E C Varnum, Barber-Colman Co (given by Mr Varnum), and the other on "Design of High-Speed Gears for Extreme Conditions" by Professor Earle Buckingham and T W Khiralla, Technical Products Inc (given by Professor Buckingham).

"Our national strength rests on the sound foundation of an alert, capable military-industry team," Mr Powell declared. "Modern weapons do not give time enough for obsolete thinking. We must outsmart potential enemies by unleashing our fettered imaginations. We must think in terms of the accelerating technological age in which we live."

Mr Powell stressed the importance of each manufacturer working with his armed services procurement planning officer (ASPPO) in setting up military planning within his plant. The ASPPO represents all the armed forces. He should be encouraged to do two things: 1) make a good informative survey of your plant, with your help; and 2) build your production know-how into mobilization production schedules before you sign them. These "stockpiled production schedules" are viewed by the Defense Department as "industrial battle stations."

"It is up to you to work out the best compromise between military logistic requirements and your plant capacity," Mr Powell pointed out. "Our planning is only as good as you and your ASPPO make it."

CONNELL AWARD RECIPIENT
George H Acker
President
Cleveland Worm & Gear Co

LeRoy R Brooks, president Tool Steel Gear & Pinion Co, Cincinnati, was elected president of the association for the next year. Other officers: E F Borisch, executive vice president Milwaukee Gear Co, Milwaukee, vice president; and John L Buehler, president Indiana Gear Works Inc, Indianapolis, treasurer.

Executive committee members are: Russell C Ball Jr, vice president Philadelphia Gear Works Inc, Philadelphia; H G Bauer, vice president DeLaval Steam Turbine Co, Trenton, N J; Lewis J Burger, general manager Gear Motor and Transmission Components Department General Electric Co, Paterson, N J; J Harper Jackson, sales manger Jackson Gear Co, Pittsburgh; Charles L Kessler, president Beaver Gear Works, Rockford, Ill; and Louis H Schrader, executive vice president D O James Gear Mfg Co, Chicago.

George H Acker, president Cleveland Worm & Gear Co, Cleveland, received the Edward P. Connell Award for 1957 from the association. This award is made not oftener than once a year to a person who has made an outstanding personal contribution to further the art of gearing. Mr Acker has spent more than 30 years in the design and manufacture of gears and reducers.

German Aircraft Industry Marks Time

BONN, GERMANY—While most of West Germany's reborn-after-World-War-II industries are riding the crest of a boom, that nation's aircraft industry is twiddling its collective thumbs. Officially, Germany's airframe industry came back to life last year when the Defense Ministry placed military orders with eight manufacturers, divided into four working groups. Three of the groups manufacture military airframes under license from foreign countries. The fourth is producing a designed-in-Germany military liaison plane, which will also have a civilian counter part.

Trouble is that the real prime movers of any industry—research and development—are still missing among German airframe makers. Not only that, the military orders in themselves are insufficient to act as the keystones upon which to form a major aircraft industry. Thus the airframe makers are marking time awaiting (1) made-in-Germany engines for their planes, and (2) orders to start rolling in for more military aircraft and for civilian planes.

To date, no engine orders have been booked for German-made planes, although a half-dozen engine manufacturers (including Daimler-Benz, Heinkel, Junkers, Krupp and Essen and Ilo-Werke) are ready to go to work as soon as the green light goes on for more planes of both civilian and military types. Too, Bayrische Moterenwerke A G at Allach, said to be potentially the best plant in the country for jet aircraft engine production, has been waiting expectantly, but without results so far, for an order from Germany's Defense Ministry to make engines under license from America's Lycoming for DO 27s and Piaggio 149s.

It is estimated that 4000 men are today employed in West Germany's aircraft industry, but in many cases these men are the nucleus of designers, engineers and top technicians which could be expanded if and when orders roll in.

But civilian transport plans and development are almost quiescent. The Federal Association of the German Aircraft Industry says there are no plans for German-made jet transports, and that only Hamburger Flugzeugbau GMBH of all manufacturers has shown any interest in making them. This firm, which is licensed to make the French military Noratlas transport, has also obtained a Spanish license to build the Casa 207 Azor, powered by two Napier Eland 6 turboprops. The German development will be called the HFB-C 209 Super Azor, will accommodate 40 to 50 passengers and is designed for short and medium-stage flights.

At the moment, helicopters seem to have caught the Germans' aeronautical fancy. The Germans feel that little progress has been made in this field in recent years, that there's plenty of room in world markets for a better helicopter. Borgward-Focke-wulf wants to get into this field. So does Weser Flugzeugbau GMBH of Bremen, which is talking about making further developments on the Vertol H21, to be assembled and serviced by Weser under U S license. Also busy with helicopter development work is Suddeutsche Flugzeugwerke K E Merckle of Stuttgart.

Some Light Plane Manufacture

Several West German firms are already engaged in light plane manufacture, but on a very modest scale. A number of German-produced light planes were exhibited recently at the Essen-Mulheim Airport in West Germany's first postwar aeronautical exhibition. Included were a civilian version of the DO 27, a six-seater, biggest of the lot; the BL 502, a four-passenger all-metal sportplane made by Focke-Wulf; the RW 3, an all-metal combined glider-motor aircraft by Rheinwest Flug; the KL 107 A, a wooden 3-seater by Klemm and Boelkow; the Motorraab, a steel and wood 2-seater by A Puetzer; the Dohle, a glider with small auxiliary motor by Puetzer and Raab; the Horten 33, a 2-seater glider and motor plane designed by Lt Col Horten and manufactured by Akaflieg of Aachen; and the Turbulent, wooden sports and training plane by Stark.

As to military aircraft, Germany's Defense Ministry has placed orders totaling $100-million-plus with the four groups of airframe manufacturers. This has been enough to start Germany's airframe makers on a machine tool buying spree. The idea today is to cut back on manual operations as much as possible in favor of machine operations. Thus Dornier and Weser have already ordered automatic riveting machines from the United States, and a number of stretching presses are on order with U S firms, too. But in the main, Germany's aircraft industry is booking with German machine tool manufacturers. Milling cutters are becoming increasingly popular. Riveting procedures are no longer used in wing construction, incidentally.

As it stands today, West Germany's aircraft industry is divided into four manufacturing groups:

Focke-Wulf and Blume Engineering have combined engineering and manufacturing resources to make 194 Piaggio 149 D's under license from Italy. Focke-Wulf reportedly has 150 aluminum-working machines and a potential floor area in the neighborhood of 500,000 sq ft.

A second group, Flugzeugbau Nord, is made up of Weser Flugzeugbau of Bremen, Hamburger Flugzeugbau of Hamburg, and Siebelwerke of Donauwoerth, Bavaria. Under French license, this group manufactures 112 SNCA N 2501 Noratlas transports. Weser makes the main part of the fuselage and does final assembly of the Noratlas at its Moterenwerk Varel plant at Oldenburg. Hamburger Flugzeugbau, a subsidiary of the shipbuilding firm of Blohm and Voss, reportedly has 240 machine tools and a 600,000-sq-ft plant reputed to be the best equipped in West Germany.

A third group, Flugzeug-Union Sued GMBH is made up of Messerschmidt of Munich and Heinkel of Speyer. It is licensed by the French to manufacture 180 Fouga Magister 6M 170 jet trainers. For this purpose, Heinkel has a workable line of machine tools, and a 650-ton press.

The fourth group really isn't a group. It consists only of Dornier, which will build 469 DO 27 reconnaissance and liaison planes of its own design at Munich-Neuaubing.

Orders placed by Germany's Defense Ministry with these four groups have started the lathes, drills and other machine tools of the West German aircraft industry into motion. But they are turning in low gear at the moment, awaiting the green light of full production when a profitable civilian aircraft market is found.

South...

Southern briefs . . .

Premier Autoware Co of Cleveland, Ohio, has opened its new $1-million plant in Atlanta; it'll package and distribute company's products for the southeastern states . . . **Ford Instrument Co,** a division of **Sperry-Rand Corp,** is putting up a 150,000-sq-ft plant at Bristol, Tenn, for production of air navigation and missile systems equipment . . . Assembly operation for **Philco Corp's** automatic washing machine is being moved to the **Avco Manufacturing Corp's** plant in Nashville . . . **Combustion Engineering** has discontinued manufacture of domestic water heaters and tanks at its Chattanooga plant; space will be used for production of boilers and related equipment . . . **General Motors** will build a $1-million distribution center at Birmingham . . . Expansion of sheet and plate-rolling facilities started in 1955 at the Alcoa (Tenn) plant of **Aluminum Co of America** is about finished, and a third mill for production of welded tube has been added . . . **Sinclair Refining Co** expects to have its $750,000 canning plant operation in Birmingham completed in four months . . . **Birmingham Manufacturing Co** plans to put up a $225,000 facility to turn out truck trailers . . . New normalizing, painting, and waxing line for production of industrial metal strapping has been put into operation at the **Cotton Tie Mill** of **US Steel's Tennessee Coal & Iron Div** in Birmingham . . . **Gibson Electric Co,** Pittsburgh maker of electrical contacts and contact assemblies, has opened a new sales office at 117 E Third St, Charlotte, NC; it'll service the southeastern states . . . **Link-Belt Co,** Chicago, has acquired 41 acres of land about 11 miles south of Atlanta as a possible future plant site.

Midwest...

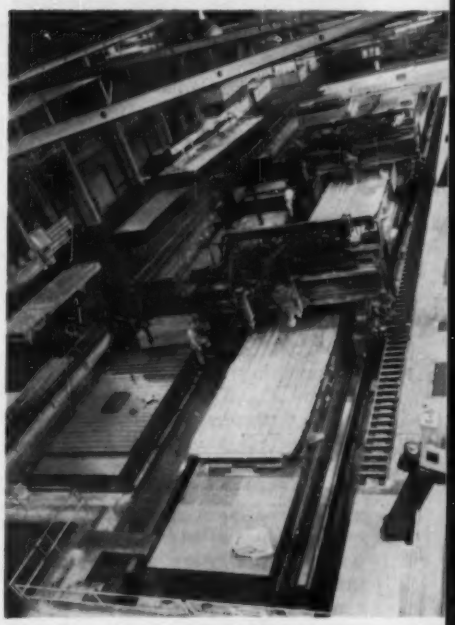
Midwest newsnotes . . .

White Motor Co, Cleveland, has purchased assets of **Reo Motors,** Lansing, Mich, subsidiary of **Bohn Aluminum & Brass.** Cash purchase is said to have been around $4 million . . . **Eaton Manufacturing Co's Axle Division** will turn out a new truck axle that incorporates for the first time the two-speed feature in a tandem. John C Virden, Eaton's chairman and president, says the division is the first gear producer to use a new steel in gears which effects a 70% reduction in the use of alloy nickel . . . **Toledo Electronics Division** of **Kaiser Aircraft & Electronics Corp** has contracts for more than $1.7 million to produce guided missile testing equipment . . . **Reynolds Metals Co** has opened its new facility for production of aluminum alloy jet aircraft wings at McCook, Ill. Installation, housed in five buildings, contains the world's largest plate stretcher; it exerts pull equal to 230 diesel engines . . . **E Edelmann & Co,** Chicago, has bought the **Wayne Metalcraft Co** of Detroit, will operate it as a division. Both companies are tooling for production of a new radiator pressure cap for pressurized cooling systems . . . **Firestone Tire & Rubber Co,** Akron, has been awarded a contract by **Martin Co** to develop and test vital components of the new Matador TM-61-B guided missile . . . **Massey-Harris-Ferguson,** farm machinery manufacturer, has purchased **Mid-Western Industries, Inc,** Wichita, Kans, maker of light industrial equipment. Acquisition, with sales volume of about $1 million a month, will become part of the **M-H-F** industrial division . . . **Panelyte Division** of **St Regis Paper Co** is consolidating the injection molding plant of its subsidiary, **Cambridge-Panelyte Molded Plastics Co** and the vacuum forming plant of **St Regis Panelyte** at Richmond, Ind . . . Merger talks are underway between **North American Car Corp,** Chicago, and **Evans Products Co,** Plymouth, Mich, maker of railroad freight loading equipment . . . **Thompson-Starrett Co,** Chicago engineering firm, has acquired working control of **Superior Tool & Die Co,** Detroit . . . **Elgin National Watch Co's Micronics Division** will put up a 20,000-sq-ft research and development center near Los Angeles.

East...

Scanning the East . . .

Chrysler Corp has a $119-million Army order to build 900 medium tanks at the government-owned Newark, Del, plant. Production is scheduled to get underway by fall and company will hire 550 workers in addition to the 250 now employed there. Operation won't interfere with work at **Chrysler's** Plymouth-Dodge eastern assembly plant located adjacent to the tank facility . . . **Metropolitan Wire Goods Corp** of Brooklyn will move its operations to Wilkes-Barre, Penna. Company will hire 150 workers initially when the new 100,000-sq-ft factory is completed in Oct . . . **Allegany Ballistics Laboratory,** Cumberland, Md, subsidiary of **Hercules Powder Co,** has a $3.5-million Army order to engineer and test experimental propulsion systems for guided missiles. Allegany plant is one of two companies working on the third stage of the earth satellite . . . **ACF Industries** has set up a new operating division, **Advanced Products Division;** it'll concentrate on manufacture of products for the petroleum, gas, chemical, and nuclear energies industries . . . **Curtiss-Wright** has come out with a new jet engine said to produce no more noise than a propeller-



Skin Mill at Reynolds' New McCook, Ill, Plant

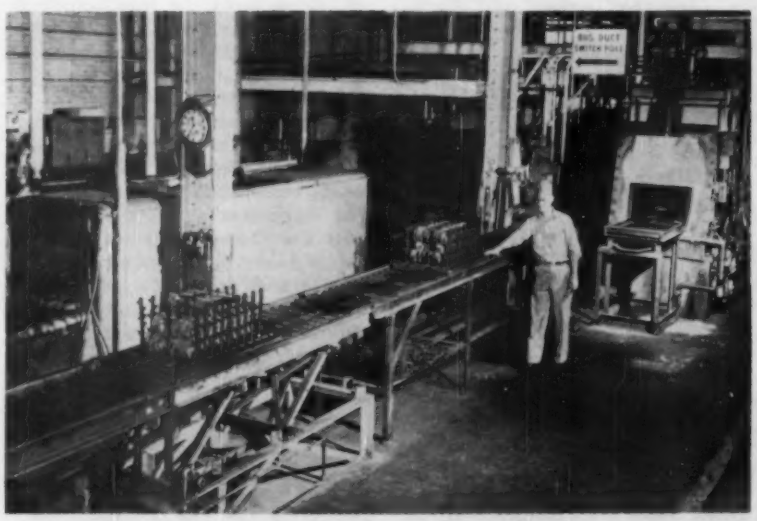
Aircraft wings and other aluminum components are being produced at Reynolds Metal's new McCook, Ill, plant on giant tools like this twin fixed-bed, gantry skin mill. This 100-ft-long unit sculptures intricate designs on wing structures, eliminates need for riveted skins. To prepare stable surfaces for this sculpturing, the McCook plant uses the world's largest plate stretcher

driven airliner. Developed jointly by **C-W's Wright Aeronautical Division** and **Bristol Aeroplane Co Ltd,** of Fulton, England, the 12,500-lb thrust TJ-38 runs 360 degrees cooler than other comparable engines. It'll be available by mid-1958 . . . . **Westinghouse Electric Corp** is supplying $6.5 million worth of electrical apparatus for installation in **Pacific Gas & Electric Co** hydroelectric powerhouses . . . **American Smelting & Refining Co** has acquired **Enthone, Inc,** New Haven, Conn, manufacturer of metal finishing specialties and equipment, will operate it as a subsidiary . . . **Titanium Metals Corp** has put through an average 10% price reduction on titanium bar, billet, wire, plate, extrusions, and nonalloy grades of sheet and strip. Sixth general markdown since 1954 is due to technological advances, says company . . . **Westinghouse Baltimore Ordnance Dept** has a $2-million Navy contract for development of a new antisubmarine torpedo . . . **Joseph T Ryerson & Son,** Chicago steel fabricator and warehouser, will expand its Pittsburgh steel service plant to increase capacity more than a third. The $1-million program will be completed next year . . . **Baker & Co,** Newark, NJ, subsidiary of **Engelhard Industries,** has acquired controlling interest in **Nuclear Corp of America,** New York-based electronics company . . . New cold finished bar mill of **Jones & Laughlin Steel Corp** has gone into production at Willimantic, Conn . . . 200 additional hourly employees are being hired by **Westinghouse Electric's** receiving tube plant in Bath, NY, as a result of sharp increase in sales over '56. Company expects it'll need more people by Sept . . . **Robertshaw-Fulton Controls Co's American Controls Division** at St Louis, Mo, will discontinue operations about the middle of July. Items made there will be handled at **Robertshaw's** facility at Youngwood, Penna.

West . . .

Shorts from the West . . .

Boeing, Seattle, will boost its payroll by 1000 during the summer months. Main reason for step-up is Bomarc guided missile production . . . **American Coleman Co,** Littleton, Colo, is scheduled to turn out $4.3 million worth of towing tractors for the Air Force. The 10,500-lb tractor is needed to tow jet aircraft heavier than 100,000 lb . . . Canada will use **Ryan** Firebee jet target drone missiles to train her flyers. Number involved in this first foreign order was not disclosed by Ryan . . . **Crane Hoist Engineering Co** has started to put up a $75,000 plant in San Leandro, Calif. The 12,000-sq-ft facility will be turning out overhead cranes and monorails by Sept, will replace present plants in Emeryville and Berkeley . . . **Food Machinery & Chemical Corp's** (San Jose, Calif) backlog of unfilled orders for commercial machinery and defense material stood at $68.1 million at first quarter's end, almost $6 million higher than backlog for same period last year . . . **Hughes Aircraft Co,** Culver City, Calif, has a $2.8-million AF contract for modification of missile components . . . and another AF order for $1,071,239 for modification of existing airborne electronic control systems used in all-weather jet interceptors . . . **Brazilian International Airlines** (Real-Aerovias) has put in a $9-million order for three **Lockheed** 1049H Super Constellations, plus spare parts. Flyers will be used on luxury air tourist runs from Buenos Aires to Chicago via Miami . . . **McCullough Tool Co,** Los Angeles, has opened a service branch at Monahans, Texas; it's servicing area with all wire line services offered by the firm . . . **American Safety Razor Corp,** New York, which has changed its name to **A S R Products Corp** (because of diversification of manufacture), has acquired capital stock of **Com-Air Products,** Los Angeles designer and maker of hydraulic, pneumatic, and fuel controls for aircraft and guided missiles. **Com-Air,** whose annual sales exceed $4 million, will operate as an **ASR** subsidiary . . . Another AF contract for $500,000 has gone to **Hughes Aircraft,** Culver City, as part of a $5-million program. Contract is for communication systems . . . **Beckman Instruments, Helipot Division** at Newport Beach, Calif, has a $400,000 contract from **Hughes** for five electronic servo computers to be used in a radar system being developed for the Navy . . . **Ryan Aeronautical Co** has acquired a 137,000-sq-ft assembly plant at Torrance, Calif. It'll use the facility for assembly of its Firebee jet drone missile, and power packages and pylons for the Douglas DC-8 commercial jet airliner. Engineering and fabrication for the projects will be based in San Diego.



One Heat-Furnace Does Work of Three

. . . at International Harvester's Farmall Works, Rock Island, Ill. In this carbonitriding furnace, a flexible conveyor setup feeds in a variety of farm tractor parts. Behind conveyor is machine that washes oil from parts after quenching. Transfer section at left moves laterally for alignment with washing machine, while transfer section at right moves laterally in either direction for alignment with furnace at right, with the washing machine, or with other furnaces

Andrew L Pontius has been elected a vice president of Illinois Tool Works. He will continue as general manager of the company's Shakeproof Division.

Russell Dupuis, Omaha plant manager of Vickers, Inc, has been made manufacturing manager of the Machinery Hydraulics Division (additional appointments below).

Eugene Caldwell has been elected president of Baker-Raulang Co. Formerly vice president and general manager of Hyster Co, he succeeds **Percy L Douglas** who continues as executive vice president of Baker's parent company, Otis Elevator Co.

Names in the News . . .

Perry A White, general controller of Baldwin-Lima-Hamilton Corp, has been appointed vice president and general manager of B-L-H's Eddystone Division, Eddystone, Penna. **Robert G Tabors,** vice president and assistant general manager of the Hamilton Division (Ohio), has been named vice president and general manager of the Electronics & Instrumentation Division, Waltham, Mass.

E M Hakanson has been appointed manager and **C H Laemmel** assistant manager of Sheffield Corp's Machine Tool Division. Also appointed: **D H McConnell,** manager of the Autometrology Division, and **Henry Boppel** and **Arthur Wiseman,** assistant managers.

William H Mathers, a director of Yale & Towne Manufacturing Co, has been elected a vice president.

E W Gentz has been appointed director of manufacturing for Potter & Brumfield, Inc, Princeton, Ind, subsidiary of American Machine & Foundry Co. He was formerly associated with the Automotive Division of Sparks Withington Co as vice president and general manager.

F V Gieryn, formerly manager of export sales, Vickers, Inc, Detroit, has been appointed sales manager of the Industrial Dept of the Machinery Hydraulics Division. **Robert A Erskine,** staff assistant to the vice president and director of engineering, has been made chief engineer, Industrial Dept.

John V Eakin has been elected vice president of Fawick Corp, Cleveland. He will continue as general manager of the Airflex Division.

Walter S Herrstrom has been elected vice president, manufacturing, of Harvey Hubbell, Inc, Bridgeport, Conn, manufacturer of wiring devices and machine screws.

John H Wright has been appointed field engineer for Nelco Tool Co, Manchester, Conn. He was formerly production metallurgist for Bendix Corp. He will act as sales liaison between the carbide tool user, the distributor, and Nelco plants in Manchester and Berlin, Conn.

David W Dewey has joined the Truck-Man Division of the Knickerbocker Co, Jackson, Mich, as sales manager.

Obituaries

Joseph B Armitage, 76, consultant vice president at Kearney & Trecker Corp since 1955, died May 30. Mr Armitage joined the firm in 1920 as chief engineer and held this post until 1943 when he was elected vice president, engineering. During his 37 years with the organization he was credited with 121 patents in the machine tool field. Mr Armitage was a member and director at large of the American Society of Mechanical Engineers and received the organization's highest award in 1955 when he was named honorary member, which carries with it a lifetime membership.

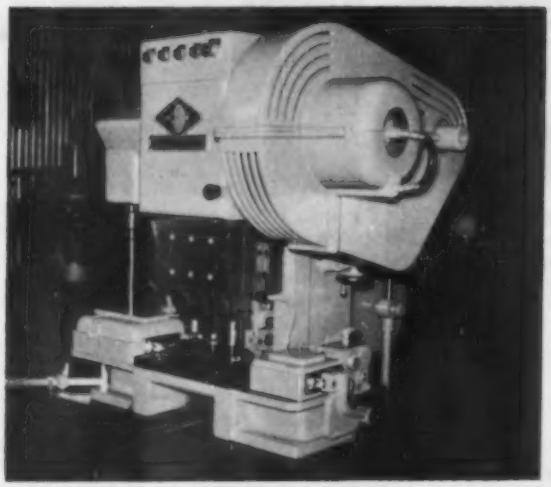
Herbert E Oatis, 62, founder of the Oatis Machinery Co, distributor of machine tools in Toledo, Ohio, and Indianapolis, died May 12. Prior to founding the firm in 1940 Mr Oatis was associated for 25 years with the National Supply Co. He was also vice president of Mill & Factory Supply Co, and an organizer and former vice president of the American Machine Tool Distributors' Association.

John J Russ, board chairman of National Grinding Wheel Co, North Tonawanda, NY died May 28.

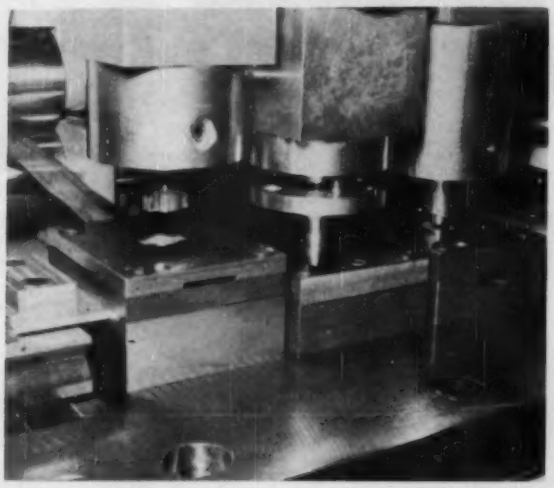
Hubert Hollmann, executive engineer of Brad Foote Gear Works, Chicago, died May 22. Mr Hollmann was a leading gear engineer, and holder of many patents.

Jack L Straub, retired president of the Bearing Co of America, Lancaster, Penna, died May 21.

New Shop Equipment



IMPACT FORMING MACHINE offers great savings in tooling costs and setup time. Built-in automatic features make possible production rates of 250 to 800 parts per min



THREE INDIVIDUAL RAMS, operating from a triple-throw crankshaft, accept modular designed plug-in tooling. Roll-fed stock enters under ram 1 (left), finished part is ejected from ram 3 (right)

Three-Ram Impact-Forming Machine Uses Plug-In Tooling

The Multi-Autoformer, an impact forming machine featuring built-in automation devices, has been built for the manufacture of simple or complex stampings. This machine reportedly has three highly significant cost-saving advantages over conventional punchpresses or multiple-slide machines.

Tooling . . . Modular designed plug-in tooling featuring standard elements allows a simplicity of die construction never before achieved. Dollar savings over conventional die sets are said to run between 20% and 60%, the higher savings occurring when using progressive dies.

Setup time . . . Greatly reduced setup time is an outstanding feature. Minimum skill is required to tear down last run's dies and install tooling for a new run. Labor savings are reported to range between 10% and 30%, as compared to any other type of stamping process.

Speed . . . Production rate is adjustable between 250 and 800 parts per min regardless of how small or large the lot run is. This speed is possible because the built-in automated transfer mechanism eliminates need for constant attendance by operator.

The machine has three individual rams operating parallel in a vertical plane. Ram 1 and ram 3 travel together being on equal crankpins. Ram 2 is connected to the center crankpin, which is 180° out of phase with the other two. Thus, when 1 and 3 are traveling down, ram 2 is traveling up.

Stock is automatically roll-fed from front to back and enters under ram 1. It is blanked away completely at this station, the perforated strip continuing out the front of the machine. The blanked-out piece is driven into a tight-fit cavity in the left-hand transfer slide-tongue which, in turn, is moved toward ram 2 on the upstroke of ram 1. Transfer travel is at right angles to the feed of incoming stock. Concurrently, finish form of a part is being done at downstroke of ram 3, by driving the pierced part out of the right-hand transfer slide-tongue where it is ejected as complete.

Oppositely, when rams 1 and 3 are up, downstroke of ram 2 drives the part out of the left-hand transfer slide-tongue cavity, piercing the blank at extreme bottom stroke.

The two transfer slide-tongues travel one on top of the other in opposite reciprocating motions in a horizontal plane. These tongues actually enter the die areas which, in turn, straddle the tongues.

Mechanically timed operation of the three rams and the two reciprocating transfer slides, together with the feed roll indexing and top feed roll lift action makes possible a complete cycle at every rotation of the crankshaft, rendering a finished part at each cycle.

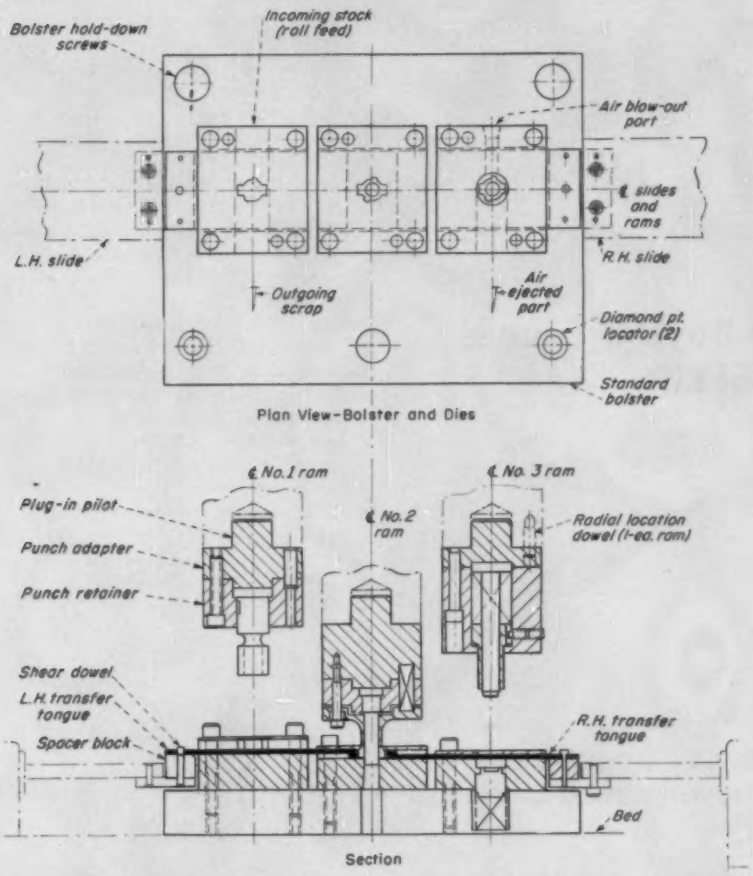
Model 3T10, with 10-ton capacity, is only machine currently available, but five basic sizes are planned—10 through 50 tons.

Specifications for a 3T10 machine include a working height (ram face to bed surface) of 8 in., open, and 6 in., closed; stroke of 2.0 in., and a transfer travel of 3 in. The ram adjustment is 1½ in., and the bolster is 1⅛ in. thick Both brake and clutch are of air-operated disk type.

Speed of the machine is adjustable in the range from 200 to 800 strokes per min. Power is provided by a 2-hp, 220/440-v 3-phase, 60-c motor.

All electrical work meets JIC

Materials and Parts . . .



PLAN VIEW AND SECTION of Multi-Autoformer show construction details of the machine, particularly the rams. Reciprocating transfer slides, which move material at right angles to the incoming feed, eliminate need for constant attendance by operator

standards or is fitted to customer specifications. Each Multi-Autoformer is equipped with an automatic centralized lubrication system.

Ampco bearings are used in the flywheel, pitmans, and crankshaft; all other bearings are Timkens. The machine weighs 2800 lb and requires 6-sq-ft floorspace. The base is portable and has a die-lubricant collector. Price is expected to be between $8000 and $10,000.

The Multi-Autoformer is believed to be a truly unique machine, the first attempt at a 3-ram ultra-precision unit. The built-in automated transfer device reportedly is an original concept in this field.

Multi-Autoform Corp, 432 West Laurel, Glendora, Calif

Electronic Unit Controls Many Functions of Shears or Brakes

Package control unit, designated Sensory Shear Director, has electronic touch sensors and photocells, combining to control the shear for insuring correct dimensions, straight sides, and square corners. Among other functions are controlling sheet operations, measuring productivity, and operating machine tools. Unit is 20 in. high, 16 in. wide, and 6 in. deep.

Sensory Inc, 504-14 Pleasantville Rd, New Vernon, NJ

...including

MACHINE TOOLS AND ATTACHMENTS

Lathe 184
Tapping-Drilling Machine 188
Threading Machine 190
Boring Mill 192
Heavy-Duty Lathe 194
Radial Drill 196

TOOLS AND ACCESSORIES

Cutting Tool 184
Portable Electric Drill 186
Boring Bars 188
Blow-Loading Machine 196
Air Hammer 206

FORMING AND FORGING

Cold-Forming Machine 186
Pivoted-Blade Shear 192
Plastic Molding Machine 198

WELDING

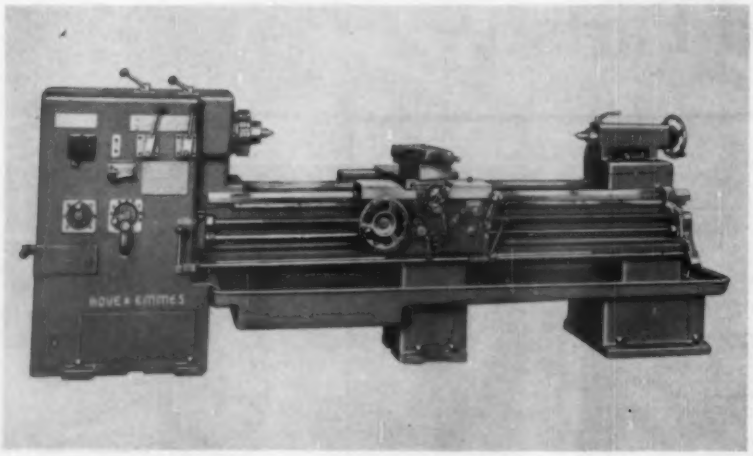
Brazing Technique 202
Welding Head Manipulator 206

INSPECTION AND LAYOUT

Hardness Testers 186
Electronic Comparator 188
Height Gage 200

PARTS AND MATERIALS

Pyroceram 184
Thread Sealant 190
Magnetic Clutch 194



Headstock Design Of Boye & Emmes Lathe Neutralizes Tool Lift

Boye & Emmes lathe, Model CB2-2516, has a max swing clearance of 25 in. over bed and carriage wings, and 16 in. over compound. One of the features of the lathe is the headstock design. The back-gear shaft and gears are located in front of the spindle where the downward pressure of the gears neutralizes the effect of the tool lift under heavy cuts.

Headstock offers 18 speeds, in geometric progression, from 20 to 1500 rpm. Speed selections are made through conveniently located levers mounted on the top of and in front of the headstock.

Spindle is made from heat-treated alloy steel. Starting and braking of the spindle can be controlled by either of two levers, one mounted on the head stock and the other at the right of the apron and traversing with it. The quick-change gear box furnishes 63 thread and feed changes, including 11½ and 27 threads per in.

Standard equipment for the lathe consists of a pair of hardened and ground centers, small faceplate, round-type toolpost, quick - withdrawing threading stop on crossfeed screw, adjustable automatic longitudinal feed stops, double compensating crossfeed screw nut, mechanical tailstock traverse, and necessary wrenches. Optional equipment includes large faceplate, steady rests, combination front and back toolrests, heavy - duty toolposts, power rapid traverse, and a complete coolant system.

Boye & Emmes Machine Tool Co, 81 Caldwell Drive, Hartwell, Cincinnati 16, Ohio

Rout-R-Mill Combines Best Features of Router and End Mill

Designed for deep cavity milling of titanium, stainless steel, aluminum, and other alloys, tool has a flute structure that is said to provide chip clearance at greater depths. It performs rough, hogging cuts and finish cuts in one operation. Rout-R-Mill has highly polished flutes and can be used at speeds up to 17,000 rpm, and at much higher feed rates than are possible with ordinary end mills.

Arrow Tool & Reamer Co, 711 Stephenson Highway, Troy, Mich

Glass Material Is Harder Than Steel, Lighter Than Aluminum

Corning Glass has announced the development of a line of crystalline materials made from glass. Trademarked Pyroceram, these materials are tough, heat-resistant substances, harder than steel, lighter than aluminum, and nine times stronger than plate glass, according to Corning scientists. Pyroceram is made by adding special ingredients to the raw materials of a glass batch. After the glass has been cooled to the solid form, it goes through a heat-treating process which transforms it from non-crystalline glass to an extremely hard, fine-grained substance.

Pyroceram products can be made in almost any shape. Material starts as glass and can be formed by conventional blowing, pressing, drawing, or spinning techniques. It can even be cut like metals. First commercial use will be for guided missile radomes.

Materials have flexural strengths up to 40,000 psi; specific gravities of 2.40 to 2.62; strength-to-weight ratio of 14.1 for Pyroceram Code 8605, compared with 13.3 for dense alumina, 14.3 for aluminum, and 10.1 for stainless steel; hardness of above R. 65 (harder than hardened high carbon steel but not as hard as sapphire). Softening temperature of Type 8065 is 1350 C.

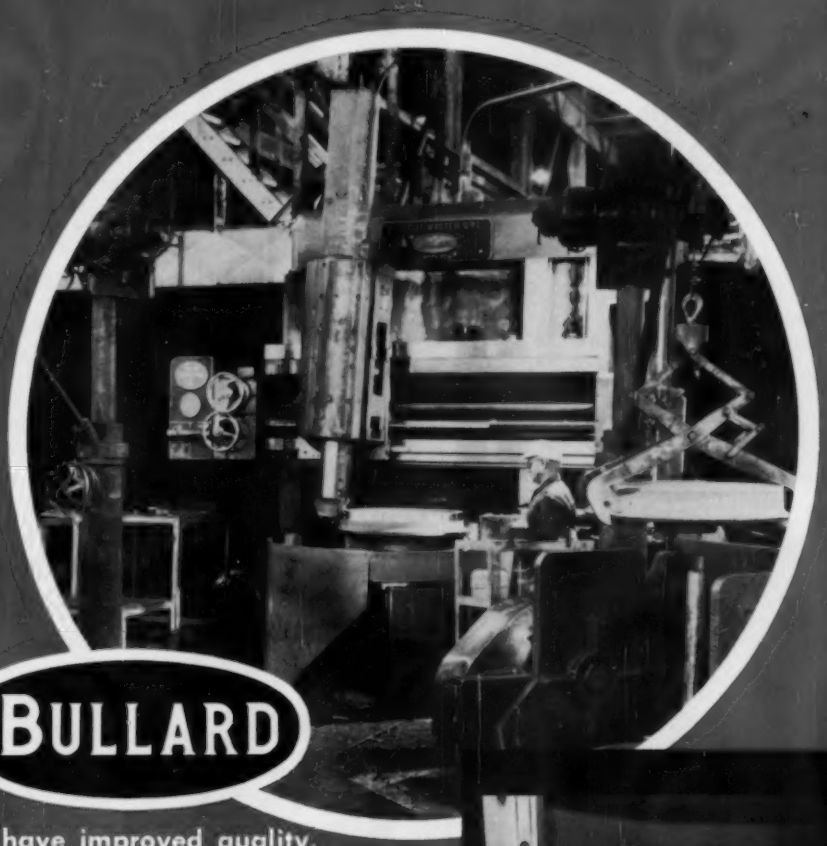
In final form, it can be transparent, opaque, or milky white. Cost will probably be little more than glass and far less than stainless steel.

Corning Glass Works, Corning, NY

Toolroom Shaper Cuts With Either Draw or Conventional Cut

Jemco H-20 universal toolroom shaper machines surfaces or profiles. A pole-changing flange motor allows shaping to be done with either a draw or conventional cut. Working range is 8 x 11⅞ in. Stroke can be changed from 60 to 120 spm. Unit is equipped with dividing head, swivel vise, 12¼ x 12¼-in. table with locking jaws, two toolholding fixtures, and a work table which can be swivelled to any position. This table can be locked in three main working positions and is provided with fitted-in clamping devices which eliminate exchanging and resetting work.

Jersey Mfg Co, 407 Livingston St, Elizabeth, NJ



BULLARD

We have improved quality, quantity and appearance of our product with . . .

BULLARD MAN-AU-TROL

MODEL 75

This has been accomplished by one of the nation's largest manufacturers of railroad car wheels.

The plant superintendent tells us "that improved quality is obtained through greater machining accuracy – that quantity is improved with Man-Au-Trol, Model 75 since each operator can machine 76 pieces per eight hour shift compared to 40 pieces by our former method – that appearance is improved because of superior finish obtained by using single point cutting tools instead of ground formed tools."

How about you? Are you employing all the advantages offered by Bullard Man-Au-Trol, Model 75, to your machining problems.

To cut costs when cutting metal . . . buy BULLARD

Call your Bullard Sales Engineer, he's as near as your telephone or write

THE BULLARD COMPANY

BRIDGEPORT 9, CONNECTICUT

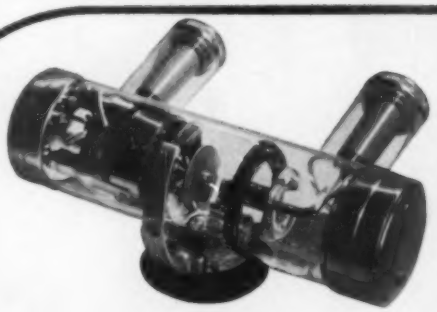
NICE BEARINGS
Help Advance
X-RAY DESIGN

Modern techniques in radio-graphic practice have placed new demands on X-ray tube capacity. These demands have been answered by Machlett Laboratories, Inc., Springdale, Connecticut, by the introduction of their DYNAMAX design. The Machlett DYNAMAX design incorporates a rotating anode mounted on highly specialized ball bearings made by NICE BALL BEARING COMPANY.

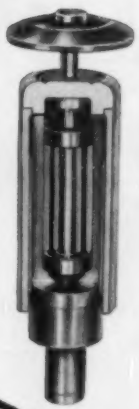
The commercial success of the rotating anode principle is largely due to the development of suitable bearings. The NICE bearings used by Machlett have proven to be the complete answer to all requirement problems. They are made to exacting tolerances from special heat resisting steel and are silver lubricated for use in high vacuum.*

Now Available! New NICE Cat. No. 190

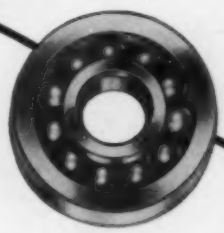
*Machlett U. S. Patent No. 2,315,280



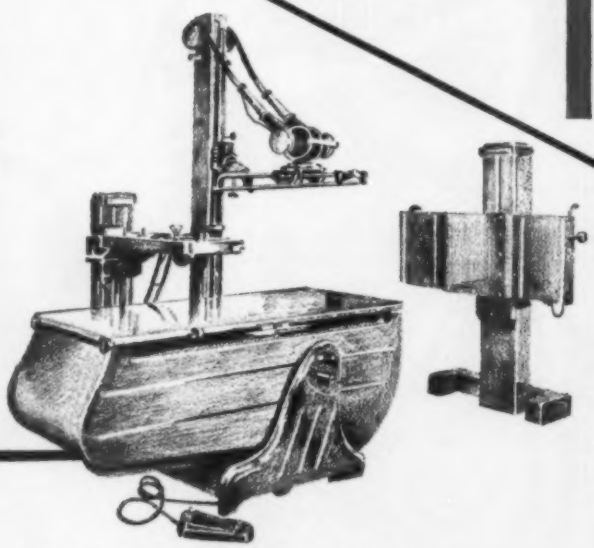
Machlett DYNAMAX "25" Rotating Anode X-RAY Tube (with plastic display case)



Cutaway View of Ball Bearing Mounted Rotating Anode and Motor Armature Core



Special NICE Bearing used at bottom of Rotor. A similar Special Bearing is mounted at top of Rotor.



Picker X-Ray Corporation Table and Tube-stand incorporating Machlett DYNAMAX

NICE

NICE is the word for **BEARINGS**

NICE BALL BEARING COMPANY
NICETOWN · PHILADELPHIA · PENNSYLVANIA

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 THREAD ROLLING MACHINE—*Landis Machine Co, Waynesboro, Penna.* 16-page bulletin E-60 illustrates and describes features of the Lanhyrol unit incorporating four rolling methods: infeed, thrufeed, continuous, and reciprocal. Auxiliary equipment, specifications included.

2 HEAVY-DUTY DRILLING UNIT—*Motch & Merryweather Machinery Co, Avey Division, Box 625, Cincinnati 1, Ohio.* 12-page illustrated bulletin 357 covers Avey's No. 4 Hydro-Way unit for drilling, reaming, spotfacing, boring and counterboring, milling, and chamfering. Unit can be mounted horizontally, vertically, or on an angle.

3 SINGLE-SPINDLE AUTOMATICS—*Cleveland Automatic Machine Co, 4933 Beech St, Cincinnati 12, Ohio.* 4-page bulletin provides illustrated information on the 1⅝ and 2¼-in. Model B units for producing such parts as shafts, arbors, spindles, studs, pins. Specifications listed, features discussed.

4 JIGBORING MACHINES—*Tripiex Machine Tool Corp, 75 West St, New York, NY.* 16-page bulletin 1256 E contains illustrated descriptions of Model 3-A for jobs where plain jigboring and boring operations are predominant, and Models SP-30 and 35-NC, combination jigboring and high precision toolroom milling and boring machines for completion of a tool or part in a single setup. Capacities and dimensions, technical data, optional equipment included. Machines are manufactured by Matheys of Belgium.

5 HEAVY-DUTY POWER SAW — *DoAll Co, Des Plaines, Ill.* 4-page brochure pictures and describes vertical feed Model 24, a 24 x 24-in.-capacity unit for cut-off sawing on large billets, bars, tubing, and heavy structural beams. Specifications and design features covered.

6 POSITIVE INDEX TABLE—*Colonial Broach & Machine Co, PO Box 97, Harper Station, Detroit 13, Mich.* 4-page illustrated bulletin JF-57 provides details on design, operation, and application of universal table that uses a no-backlash gear mechanism to provide high-precision indexing control.

7 ADJUSTABLE BED PRESSES — *Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY.* 4-page bulletin 60E (Supplement 2) contains information on Series D, specially equipped for operation in conjunction with automation line. Details of specialized controls and devices pictured and described.

TOOLS AND ACCESSORIES

8 CIMCUT CONCENTRATES — *Cincinnati Milling Products Division, Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 8-page illustrated brochure discusses oil base additives which are readily mixed with mineral oil to form metal cutting oils; designed principally for operations where water soluble cutting fluids cannot be effectively used. Applications, features, recommended dilutions, general chemical and physical characteristics covered.

9 BROACHING TOOL MANUAL — *Lapointe Machine Tool Co, Hudson, Mass.* 24-page illustrated booklet covers handling of tools while in use on machine, during re-sharpening, and in transit from one department to another. Some 50 specific recommendations advanced for prolonging tool life.

10 PRECISION TOOLS AND GAGES —*Brown & Sharpe Manufacturing Co, Providence 1, RI.* 96-page illustrated, indexed catalog 36M covers company's entire line, including several hundred new items. Applications, specifications, dimensions included.

11 LUBRICANTS — *Alpha Molykote Corp, 65 Harvard Ave, Stamford, Conn.* 16-page bulletin 110 gives details on Molykote line; describes physical and chemical properties; various types, temperature ranges, uses, method of application listed in tabular form. Separate section discusses solid film lubricating coatings.

12 CARBIDE PRODUCTS — *Adamas Carbide Corp, Kenilworth, NJ.* 32-page catalog 357 describes and illustrates complete line of tungsten carbide tools, tool tips, dies, wear parts, Dex-A-Tool mechan-

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Name .....
Title .....
Company .....
Co. Address .....
.....
FILL IN BELOW NUMBER OF ONE CATALOG WANTED
AMERICAN MACHINIST, 6-17-57 *Not good after August 17, 1957*

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

FYI
FOR YOUR INFORMATION

ical toolholder, and Ceralox sintered aluminum oxide. Detailed tabular data on all items; carbide manufacturer's grade recommendations included.

13 OIL MIST LUBRICATION—*Stewart-Warner Corp, Alemite Division, 1826 Diversey Parkway, Chicago 14, Ill.* 8-page brochure illustrates applications on 22 different machines.

14 SHEAR KNIFE HANDBOOK — *American Shear Knife Co, PO Box 355, Homestead, Penna.* 88-page illustrated, spiral-bound manual covers shear knives, rotary slitter knives and spacers, chipper knives, wearing plates. Discusses grades available, selection data, recommended applications, proper tolerances, and knife setting suggestions.

HEAT TREATING AND WELDING

15 HELIWELD EQUIPMENT—*Air Reduction Sales Co, Division of Air Reduction Co, 150 E 42nd St, New York 17, NY.* 20-page catalog 2300 illustrates and describes complete line for use in applications of company's tungsten arc Heliweld process. Presents data on various types of manual, semi-automatic, and automatic models; accessory devices and equipment covered.

16 "MODERN GAS CHEMISTRY" — *Surface Combustion Corp, Toledo 1, Ohio.* 8-page illustrated bulletin SC-178 outlines subject, discusses ability to upgrade and protect metals in heat treating. Describes principal factors in atmosphere heat treating: furnace, gas generator, and controller.

17 DC MOTOR-GENERATOR WELDERS—*General Electric Co, Schenectady 5, NY.* Illustrated bulletin GEC-1453 includes detailed product descriptions, specifications, performance curves on 300 and 400-amp units.

18 HYDRAULIC CONTROLS FOR FLASH WELDERS—*Taylor-Winfield Corp, Warren, Ohio.* 12-page bulletin SP-4A describes new controls for use on a variety of flash-welder applications. Includes information on manual, semi-automatic, and fully automatic operation, as well as schematic drawings of control linkage and hydraulic circuits.

PLANT SERVICE EQUIPMENT

19 SURFACE TREATMENT OF METALS—*E F Houghton & Co, 303 W Lehigh Ave, Philadelphia 33, Penna.* 24-page handbook covers rust prevention, mechanical and chemical cleaning, blackening, phosphating, and other aspects. Various treatment processes illustrated and diagrammed. Complete listing of products available is included.

20 FINISHING COMPOUNDS—*Frederick Gumm Chemical Co, 538 Forest St, Kearney, NJ.* 48-page catalog 10 describes CLEPO formulations for cleaning, stripping, deburring, etching, and other finishing operations. Details on processing methods, tank calculations, safety measures. Illustrated section covers plating and finishing equipment.

21 INDUSTRIAL TRUCKS — *Clark Equipment Co, Industrial Truck Division, Battle Creek, Mich.* 16-page illustrated catalog covers complete line of forklift trucks, straddle carriers, powered hand trucks, and towing tractors. Specifications given for each.

22 CONVEYOR SYSTEMS—*Chainveyor Corp, 5613 E Washington Blvd, Los Angeles 22, Calif.* Planning folder illustrates and describes power and free overhead systems. Explanatory diagram and planning grid enables plant management to determine specific needs.

23 SPRAY BOOTHS — *DeVilbiss Co, Toledo 1, Ohio.* 35-page catalog I-7000 contains illustrated information on booths of every type and size for all applications. Special section details points to consider in selection.

PARTS AND MATERIALS

24 STAINLESS STEEL STRIP AND SHEET — *Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Penna.* 32-page booklet contains tabular data on comparative properties, corrosion resistance, fabrication properties, weight tables per lineal foot in various widths and gages. Section included on proper selection, and an industry index of applications.

25 AIR AND HYDRAULIC CONTROL VALVES—*C B Hunt & Son, Inc, Salem, Ohio.* 12-page illustrated bulletin 571 gives data on Quick-As-Wink units including sliding sleeve, single plunger, O-Type, B-Type, and high-pressure hydraulic models. Construction and operating details, specific applications included.

26 MOTORS—*Marathon Electric Manufacturing Corp, Wausau, Wis.* 1957 condensed catalog covers current pricing for 1/20 through 200-hp sizes on general purpose fractional and integral hp motors. Includes slide base dimensions with diagrams and adapter information, standard modifications and dimension drawings.

27 LEADED STEELS — *Copperweld Steel Co, Steel Division, Warren, Ohio.* 16-page illustrated booklet presents data on basic characteristics, mechanical properties, and workability, plus case histories of applications.

28 STUDS—*Nelson Stud Welding Division, Gregory Industries, Inc, Lorain, Ohio.* 24-page design manual discusses physical properties of various types. Covers selection, counterbore and countersink dimensions for accommodating weld fillets, recommended thicknesses of steel on which studs are welded, and stud locating procedures including templet design.

29 LUBRICATION FITTINGS — *Stewart-Warner Corp, Alemite Division, 1826 Diversey Pkwy, Chicago 14, Ill.* 32-page catalog, form 38-23, covers complete line including special-purpose devices, all with individual dimensions. Lists accessories with specifications, dimensions, and applications.

30 CUSTOM COLD DRAWN SPECIAL SHAPES—*Kidd Drawn Steel Co, Aliquippa 6, Penna.* 4-page illustrated booklet discusses advantages including minimum machining and fabrication, accurate dimensions, fully pre-finished, wide range of grades.

31 HYDRAULIC POWER UNITS—*Oil-Dyne, Inc, 2115A W Marquette Rd, Chicago 36, Ill.* 52-page catalog contains complete technical data and specifications on 2240 different types and models of Oil-Dyne pumps, single and duplex pressure switches, hydraulic cylinders, and full line of accessories.

GET SQUARE D SAFETY SWITCHES AND BENEFIT FROM THE NEW NEMA STANDARDS

NEMA standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser, as well as to assist the purchaser in selecting and obtaining the proper product for his particular need.

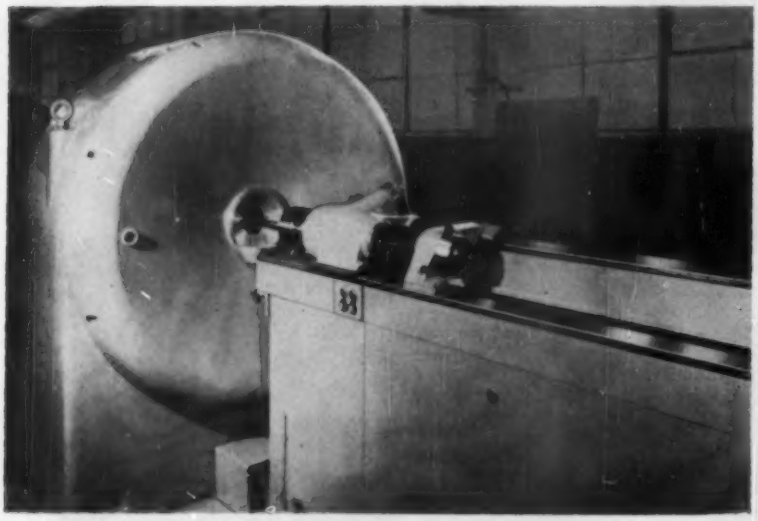
Square D's quick change to the new standards gives you the performance and safety which NEMA standards assure.

Square D Safety Switches cost no more —why settle for less?

DESCRIPTION	HEAVY DUTY New	NORMAL DUTY formerly Types H, S, or A	LIGHT DUTY formerly Types D or G
Rating-Ampere Voltage	30—800 250 or 600V AC, DC	30—1200 250 or 600V AC, DC	30—200 250V AC
Enclosure	NEMA 12 • Industrial Use (Gasketed) NEMA 4 & 5 • Water-tight & Dust-tight NEMA 7 • Explosion-resisting Class I—Group D NEMA 9 • Explosion-resisting	NEMA 1 • General Purpose NEMA 3R • Raintight	NEMA 1 • General Purpose NEMA 3R • Raintight
Horsepower Rating	NEC Fuse Ratings Dual-Element Fuse Ratings	NEC Fuse Rating Dual-Element Fuse Ratings	NEC Fuse Rating
Operating Mechanism	Quick-Make, Quick-Break Independent of Handle	Quick-Make, Quick-Break Independent of Handle	Positive Make, Positive Break Spring Assisted
Cover	Interlocked & Padlock Attachment	Interlocked & Padlock Attachment	Padlock Attachment
Plating—Current Parts	Extra-Heavy Silver	Silver	
Endurance	Maximum Endurance Far Exceeds UL Standards	Exceeds UL Standards	Meets UL Standards

***NOW...EC&M* PRODUCTS ARE A PART OF THE SQUARE D LINE**

SQUARE D COMPANY



Cold-Forming Machine Produces Close-Tolerance, High-Finish Bores

ellows Gear Shaper Co has acquired the license to manufacture a machine for the cold forming of metals by the Appel Cold Forming Process. This process comprises cold forming through kneading or plasticizing materials at a very low temperature, probably never in excess of 150 F. The machine transforms the original shape of the unworked material into the desired shape by the action of the forging elements which, under control, increase the uniform circumferential pressures on the outside surface of the work with each stroke.

Parts which can be produced to the greatest advantage are cylindrical pieces where bores of close tolerances with high degree of surface finish are required. Tubular parts with a cylindrical OD where the bore has a contour, such as internal splines or square holes, are relatively easy to make. Both ferrous and non-ferrous materials can be formed—as long as the materials are ductile.

Operating motion is derived from rotating eccentric shafts. A mandrel is used for producing the internal contour. The forming elements force the work down on the mandrel to form the shape required.

The No. 4 Fellows-Appel cold forming machine consists of a forging unit and a feeder. The work is fed into the forging unit where the forging dies are simultaneously forced onto the work in a direction radial to its center. Rate of feed is dependent upon the amount of deformation per stroke. The number of strokes, feed, and rotation of work are variable and depend upon the material, its size, shape and physical properties.

Surface finish produced is 8-10 mu-in., although a finish of somewhat better than 2 mu-in. can be obtained.

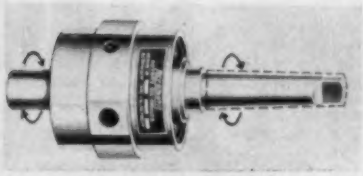
Fellows Gear Shaper Co, Springfield, Vt

Motorized Hardness Testers Make Regular and Superficial Tests

Two new Kentrall motorized combination hardness testers are latest additions to company's line. Available as standard models in both 8 and 12-in. vertical capacity, these units reduce operator fatigue by motorization of the major load. Production reportedly can be increased by as much as 10 to 20%.

Motorization removes the human element that often influences results. Load flexibility is another feature of these units. Either of the machines can make tests on all Rockwell Regular and Superficial scales. On special order, company can supply 4 and 16-in.-capacity machines.

Torsion Balance Co, Clifton, NJ

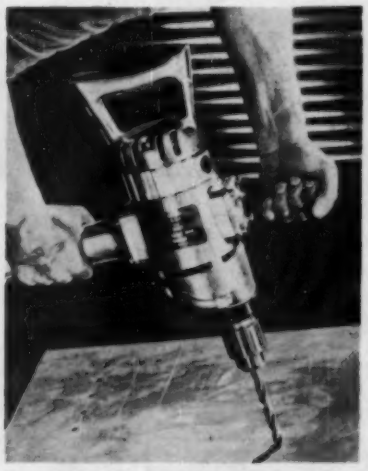


Acromatic Rotary Oil Inducer Speeds Deep-Hole Drilling

Heavy-duty unit, designed to eliminate friction and heat generation, assures constant pressure flow of oil at drill cutting point. Device is adaptable to gun drills as well as all types of oil-hole drills.

Models 6000-6010 for direct attachment to vertical or horizontal drilling equipment are available with tapered shank, straight shank, or flange. Model 5000 is a high-speed, high-pressure unit for use with hollow shafts or spindles. It is attached at shaft end for transfer of oil to actuate clutches, power cylinders, or to deliver coolant for drilling.

Acromatic Tool Co, 21150 Coolidge Rd, Oak Park, Mich



PORTABLE ELECTRIC DRILL, ½-in. Heavy-Duty drill, is one of three new models which feature up to 130% more power, 3-position reversing mechanism drives, positive key-drive chuck. Other models are the ⅝-in. Heavy-Duty, and the ¾-in. Standard drill. Weights range from 15¾ to 17¼ lb—*Black & Decker Mfg Co, Towson 4, Md*

Skinner power chucks will cut your over-all machining costs

Right from the start, you begin to add up savings in cost-per-piece when you equip your production machines with Skinner Power Chucks. Instantaneous gripping and releasing by these air-powered Skinners cut substantially the over-all time required for machining.

If you're using manually operated chucks on your production machines, you're running your costs up with every cut, and wasting operators' time with hand wrenching. Skinner Power Chucks enable you to get the full time-saving advantages of modern engine and turret lathes by converting them to high production machines.

We'd like to show you how Skinner Power Chucks will reduce machining costs on production jobs in your plant. Write Dept. 106 for Catalog 68P, with complete specifications, applications and installation instructions.

Simple, Dependable Safe Operation

The tight gripping jaws are closed or opened instantly by an actuating wedge, operated by a double-acting air cylinder. This simple mechanism is positive and trouble-free—there are only four moving parts in the chuck head. If air pressure suddenly fails, the jaws do not release the work piece, but continue to hold it tight until air pressure is restored.

Operator's Hands Are Free To Guide Work Pieces

Skinner Power Chucks are operated either by foot or hand valves. The operator can position work pieces and close jaws instantly, sure that the piece is correctly and firmly held with equal pressure. Cuts operator fatigue, too—air pressure does the hard work.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

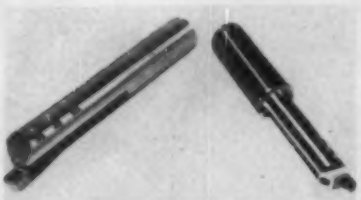
Tapping and Drilling Machine Takes Single or Multiple Spindles

Combination tapping-drilling machine, which will perform single or multiple-spindle operations, is completely air-controlled for up to 50 semi-automatic or automatic cycles per min. A direct spindle-reversing feature eliminates need for separate single or multiple-spindle clutch-type tapping heads. Taps fit directly into collets or chucks.

Quick changeover allows user to reduce the number of fixtures and holding devices; motor controls facilitate the tapping of left-hand threads. Tool capacities in mild steel are said to be: tapping—four ⅜ in., six or more 10-32, or a single ⅝ in.; drilling—four 5/16 in., six or more 3/16 in., or a single ⅝ in. Other specifications include 4-in. spindle travel, No. 33 chuck taper, No. 2 Morse taper socket-type spindles, and capacity to drill to center of 15-in. circle.

Device called Lead - to - Feed Checker positively and visually determines when the ideal thread lead-to-feed conditions have been attained in setup.

Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio

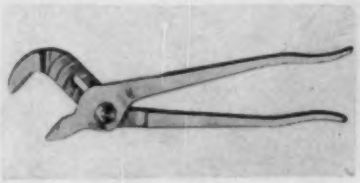


Boring Bars Have Extra Rigidity, Can Be Adjusted to Tenths

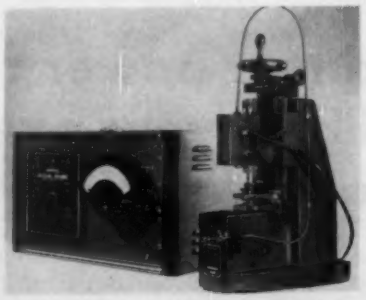
Cutter, which is always "out front," minimizing overhang, permits use of a bar with bigger diameter shank for extra strength.

Screw on side of cutter provides easy adjustment to tolerances as precise as machine spindles permit, even on the 1-in. size bars. Rigidity of the bar enables it to hold fine adjustment, bore deeper holes to the full bar length, and minimize tool drag marks. Some jobs can be bored and counterbored with one tool, according to manufacturer. Standard capacities are from 25/32 to 6¼ in. in the 30 sizes.

Buck Tool Co, 2015 Schippers Lane, Kalamazoo, Mich



RIB-JOINT PLIERS use tongue and groove locking mechanism to remove tension from pin. Tools are available in three sizes: 5 in. long, 3 jaw adjustments; 10 in. long standard, 6 adjustments; and 10 in. long heavy-duty, 6 adjustments—*Owatonna Tool Co, 383 N Cedar St, Owatonna, Minn*

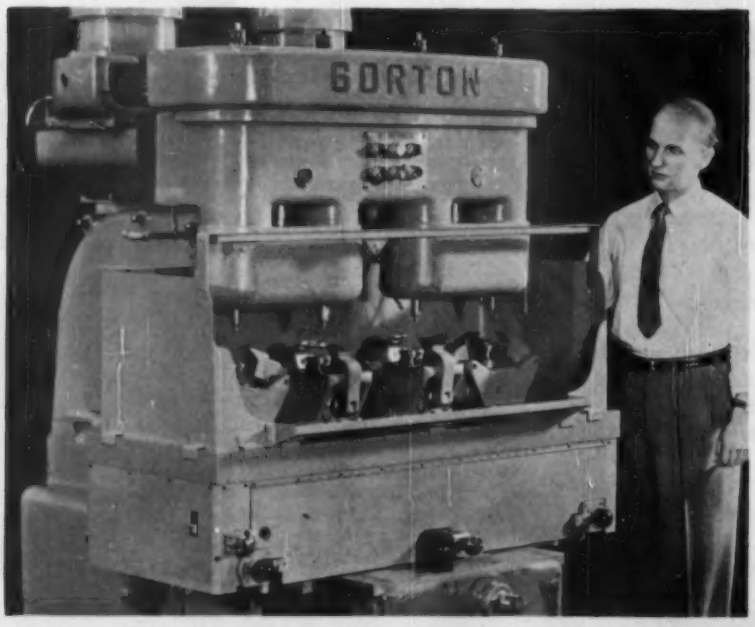


Variations of One Millionth of An Inch Detected by Comparator

Electronic comparator, Model 130 B-9, will detect dimensional variations as small as one millionth of an inch. Gage consists of three parts — an electronic amplifier, indicating meter, and electronic gage head mounted on an adjustable column. Gaging spindle is mounted within gage head on pantograph reed springs rather than in bushings to provide frictionless motion transfer.

Any one of four magnifications can be selected by switching. They range from 60,000 to 1 (0.000001-in. graduations) to 2000 to 1 (0.000030-in. graduations). Ample electrical zero adjustment is provided; gage capacity is adjustable.

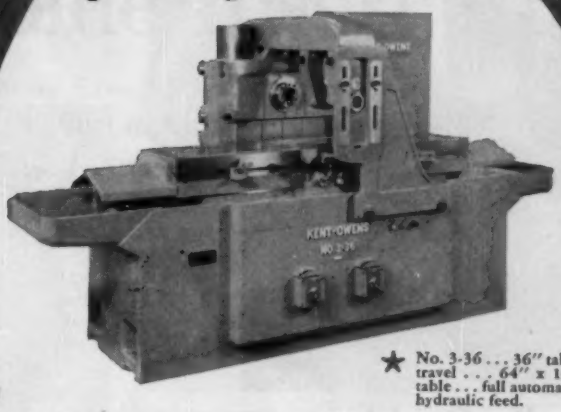
Federal Products Corp, 1144 Eddy St, Providence 1, RI



BEVELED GEAR BLANKS are machined in this special 4-spindle vertical milling machine which mills out two recesses. Operator unloads and loads two fixtures while two pieces are machined. Speeds are infinitely adjustable, and the machine accepts a 3-D hydraulic tracer control. Production is 200 pieces per hr —*George Gorton Machine Co, 1321 Racine St, Racine, Wis*

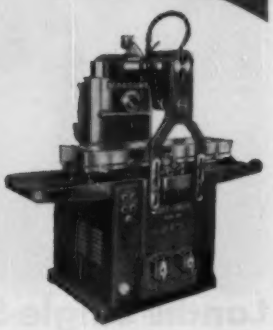
Every one a Star

for speedy accurate milling!



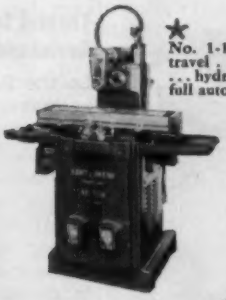
★ No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.

★ No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

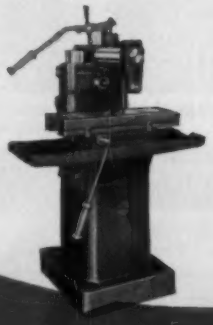


★ No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

You'll turn out milling jobs with stepped up speed and accuracy with the work on Kent-Owens Machines! These extra-rugged Millers are performance-proved . . . simple . . . versatile . . . practical in every detail. Advanced features throughout! Twin-post head mounting assures balanced load. Only two gear contacts, motor to spindle, means greater cutting efficiency. Check your needs! Write today for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.



★ No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



★ No. 1-M . . . Hand feed to table and head . . . 25" x 9" table travel . . . head counter-balance is adjustable.

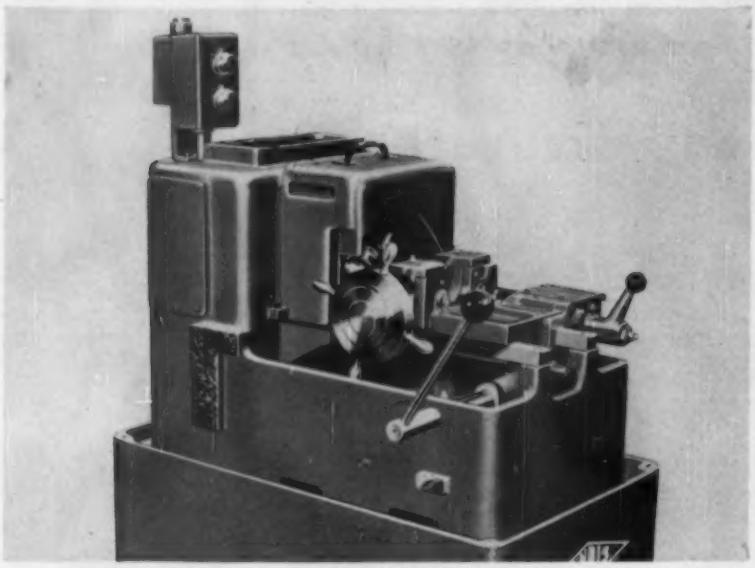
CALL ON

KENT-OWENS

for milling machines

KENT-OWENS REPRESENTATIVES

BOSTON
HARTFORD
NEW YORK
PHILADELPHIA
Cohen Machinery Company
PITTSBURGH
ROCHESTER
F. W. Schaefer Machinery Co.
SAN FRANCISCO
Kelmel Machinery Co.
ST. LOUIS
Wm. Schaer Company
SYRACUSE
BUFFALO, ONT.
WINDSOR, ONT.
CHICAGO
CLEVELAND
DALLAS
DAYTON
C. H. Geringer Machinery Co.
DETROIT
A. C. Hendershot Machy. Co.
FT. WAYNE
GRAND RAPIDS
HAMILTON, ONT.
HOUSTON
INDIANAPOLIS
Glass Machinery Co.
KANSAS CITY
LOS ANGELES
MILWAUKEE
MINNEAPOLIS
The Schaefer Company
MONTREAL
NEW ORLEANS
Oliver H. Van Horn Co., Inc.



Landis Single-Spindle Machine Threads Small-Diameter Workpieces

Model 5C Landmaco threading machine, designed for precision threading of small-diameter workpieces, will produce threads to Class 3 and 4 tolerances on a production basis and has a range from No. 4 to ⅝ in. Machine can be furnished with or without leadscrew feed. It is equipped with a 5VVV die head; head has tangential chasers which can be ground for 80% of their original length. An air-operated carriage front, air-operated carriage return, automatic or manual work stop, and a variety of special carriage fronts can be supplied.

Eight spindle speeds, ranging from 150 to 1000 rpm, are provided by a geared headstock and V-belt-pulley drive. Higher or lower speeds are available for special use. Through a Hi-Lo shift mechanism, each step of the 4-step cone pulley delivers two spindle speeds.

Carriage has nominal 4½-in. travel. Total available thread length varies slightly with carriage front, die head chaser, and auxiliary equipment supplied. Carriage front or vise is operated by a hammer-blow-type handwheel. Front is adjustable both horizontally and vertically to assure precise alignment of work and spindle. The leadscrew is changed for each different pitch thread to be produced. This is easily done by loosening one screw, and removing a retaining washer. Leadscrew is reversible end for end.

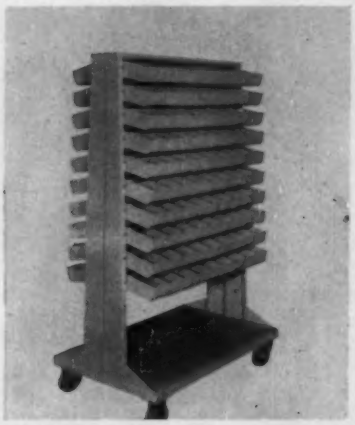
Landis Machine Co, Waynesboro, Penna

Vac-U-Max Unit Transfers Fluids at High Speed

Vac-U-Max tank kit offers a simple, fast, and safe means of picking up and transferring of fluids into standard drums or larger tanks. It will fill a 55-gal drum in less than 90 sec. Unit is completely portable. Compressed air passing through a jet venturi creates a constant high-suction vacuum to lift and carry fluid.

When mounted on standard drum, flanged tube with neoprene gasket fits into smaller (¾ in.) bung opening and the joint is sealed by gasket. A 2-in. elbow screws into the larger bung and connects to suction hose. Various size adapters are available to fit other size hoses. Units for handling solid materials or wastes, sludges, metal chips, and powders are available as standard items.

Vac-U-Max Sales Co, 1 Montgomery St, Belleville 9, NJ



PORTABLE SMALL PARTS BIN is available with five sizes of removable bin boxes, 6 in. front to back, 2¾ in. deep and widths from ¾ in. to 11⅛ in. Dimensions of frame of unit shown are 24 x 36 in. x 62 in. high—*Bathey Mfg Co, Plymouth, Mich*

Thread Sealant Provides Maximum Resistance to Vibration

Loctite Sealant permits studs to be permanently secured without the use of interference threads, and they can be sealed fluid tight. Ordinary nuts and machine screws can be locked with a grip that is 60-70% of the torsional strength of the fastener, providing max resistance to vibration, without danger of breaking fastener in disassembly. For delicate adjustment screws or nuts, material is said to provide a holding power that is a compromise between vibration resistance and ease of adjustment.

Sealant wicks into engaging threads and hardens to form a tough heat and oil-resistant plastic. The gripping power is proportional to the engaged length. Sealant is available in four strengths: A, C, E, and H; grade A being ten times as strong as grade H. Material can also be used for locking dowel pins, soldering and sealing tubing, and sealing joints against dirt.

American Sealants Co, 103 Woodbine St, Hartford 6, Calif

Machining Titanium at Lower Cost with Throw-Away Carbide Insert Tooling

V-R Face Mill Cutters Save $169.60 In Machining 1186 Cu. In.

A change from brazed tipped tools to throw-away insert carbide tooling has effected major economies in machining titanium at Convair Division of General Dynamics Corporation (San Diego Plant II). Following is a typical example.

Job: Machining AMS 4925 titanium bar stock on Cincinnati vertical mill. Depth of cut from .08" to .220". Feed .004 IPT. Speed 95 RPM (100 SFM). Total stock removal 1186 cubic inches. V-R grade 2A5 carbide throw-away inserts.

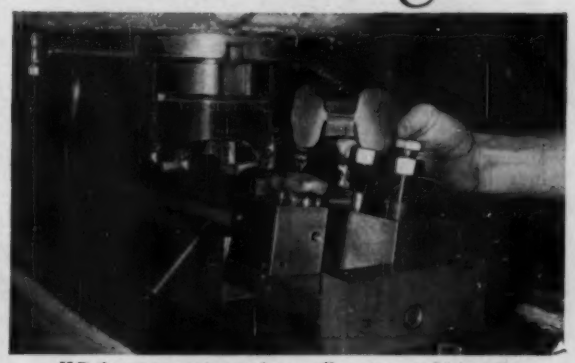
COST COMPARISON

	Old Method	New Method
Tool	Brazed tip cutter	Vascoloy-Ramet 4" dia., 30° lead angle neutral rake cutter with V-R Grade 2A5 ⅜" square carbide throw-away inserts
Stock removal per cutting edge	25 cu. in. per grind	99 cu. in. per corner (4 usable corners)
Carbide cost	$20.00	$33.60
Regrind cost	$94.00	None
Downtime	470 minutes for cutter changes—$94.00	24 minutes for insert changes—$4.80
TOTAL COST Tool repair and downtime	$208.00	$38.40

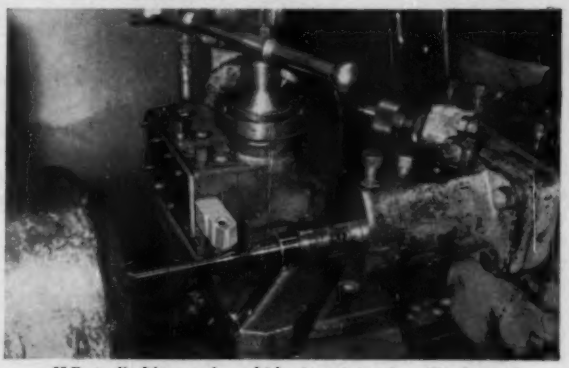
For complete data on cost-saving V-R throw-away insert style face mill cutters, ask for Bulletin VR-571; for single point toolholder data, Catalog VR-437. Call your local V-R Representative or Distributor, or write:

FM-600

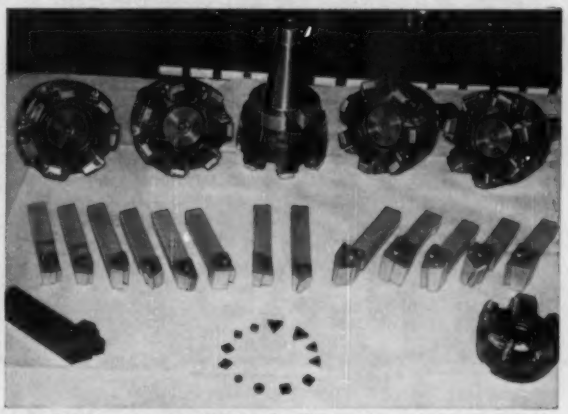
Convair-built F-102A supersonic jet interceptor incorporates many titanium parts.



V-R throw-away insert face mill cutter machining titanium at Convair Division.



V-R toolholder and carbide insert turning titanium at Convair Division.



Display of typical Vascoloy-Ramet throw-away insert type tools used at Convair Division.

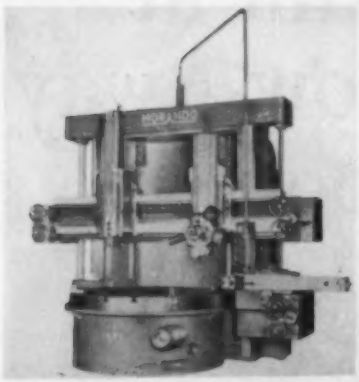
Cemented Carbides • Tantung Cast Alloys
Toolholders • Carbide Cutting Tools

840 S. Market Street
Waukegan, Illinois

V-R

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION



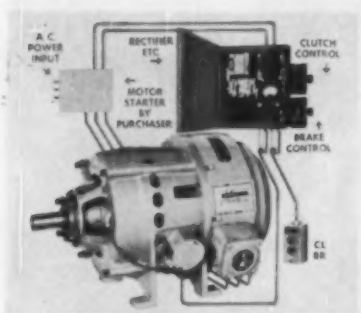
Vertical Boring and Turning Mill Permits 7 Sliding Head Setups

Morando Model VK20 (Italian) incorporates a hydraulically controlled gear-change unit that provides 16 spindle speeds in three ranges. Tables are supplied with 4-jaw chuck with independent jaws embedded and inserted; flat-surface chuck with four pairs of parallel T-slots to accommodate clamps; or with 3-jaw compound dual-control chuck that can be independent or self-centering.

Automatic stops with micrometric adjustment can be provided on both vertical or side heads. Sliding head combinations that can be set up are turret and side head; ram and side head; two rams and one side head; ram, turret and side head; ram and turret head; two ram heads; and turret head.

Max swing with side head is 83 in.; max turning height, 59 in.; table dia, 79 in.; max weight of work, 12 tons; hp for main drive, 50.

Imported by Maserati Corp of America, 662 Main St, Westbury, Long Island, NY

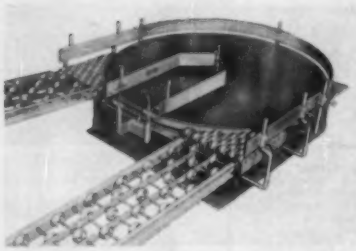


Motor-Clutch-Brake Drive Controls Punches, Shears, Indexing Tables

A package motor-clutch-brake drive, complete with controls, can provide fast or slow starts with acceleration, deceleration, and/or stops in automatic cycles up to 30 per min. Designed around a Fairbanks-Morse axial air-gap motor closely coupled to magnetic clutch and brake components, the unit is available in sizes from 1-½ to 15 hp, all with constant torque at standard motor speeds between 600 and 1800 rpm.

These drives are used to operate shearing and punching machines, conveyors, and indexing tables. The clutch magnets produce max torque on low dc voltage (6 to 12v) and current (3 to 4 amps).

Erickson Merritt, Inc, 524 Pine St, Lockport, NY



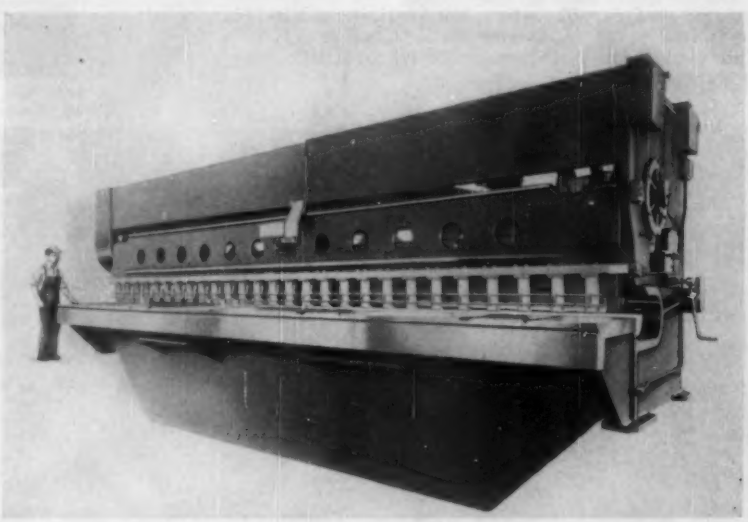
POWERED TURNTABLE has 48-in-dia disk which is driven at 25 rpm. Unit is designed to handle either 90° or 180° turns, requires only 5 × 5 ft of floorspace, and has adjustable-height inner and outer guards—*Samuel Olson Mfg Co, Inc, 2418 Bloomingdale Ave, Chicago Ill*

Telemetering Load Cycle Counter Counts Only Work Performed

Device differentiates between idling, dry run, and load cycle, counts only operations actually performed. It is actuated by sensing the current flow to electrically driven machines, or tempering, welding, and other electrically powered operations.

Unit is adaptable for accurate proximity or impact counting. Telemetering feature permits simultaneous counting at the machine and at a remote location, such as production control center. It is available with resettable 6-digit counter, speed up to 1000 counts per minute; power consumption is 25 w.

Ram Meter, Inc, 1100 Hilton Rd, Ferndale, Detroit 20, Mich



PIVOTED-BLADE SHEAR cuts 26 ft of ⅜-in. mild steel at speed of 30 spm. Features of shear include all-welded one-piece frame, air-operated clutch and brake, Micro-set knife adjustment, electric footswitch operation, 48-in. range back-gage, and air-operated blade counterbalance. Bed is 38 in. wide at top and extends 38 in. below floor. Shears can be built to cut lengths up to 30 ft and thicknesses to 2 in.—*Cleveland Crane & Engineering Co, Steelweld Machinery Div, Wickliffe, Ohio*

stop cut it with CAPEWELL

1881

power hack saw blades

THE USER: Reisner Forge Company, South Gate, California
THE MATERIAL: Stainless Steel Billets
THE JOB: High speed production-line power hack sawing
THE PROBLEM: Blade breakage . . . too few cuts per blade
THE ANSWER: Capewell Safetech Power Hack Saw Blades
THE RESULT: Long blade life . . . blade breakage virtually eliminated.

The Reisner Forge Company chose Capewell's shatterproof Safetech Blade for this long, heavy job because they could get more cuts per blade quickly and economically under heavy feed, while providing complete operator safety. Other Capewell Power Hack Saw Blades are Technite and High Speed—each of these all-hard blades is designed to give proved maximum sawing performance.

You, too, can improve your production by standardizing on Capewell Power Hack Saw Blades. Tooth by tooth, you'll find that Capewell blades are a superior product, manufactured to rigid specifications, so that you can be assured of blades that stay sharper longer.

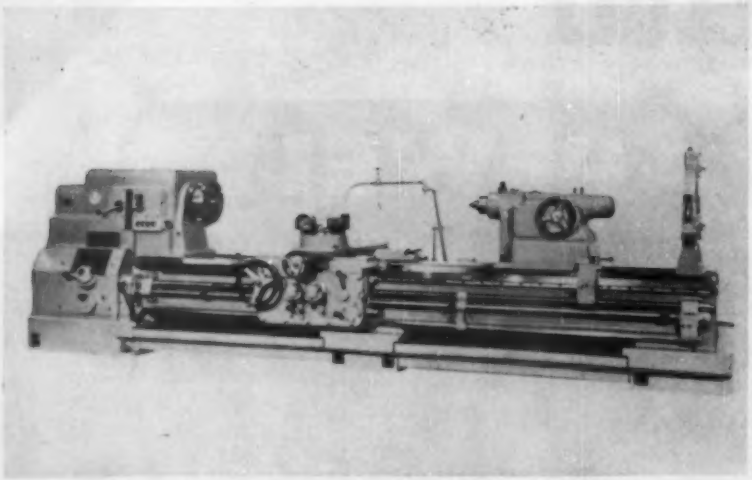
76 CAPEWELL ANNIVERSARY

SOLD ONLY THROUGH
CAPEWELL DISTRIBUTORS
who provide: complete inventory
. . . engineering assistance
. . . delivery when you need it.

THE CAPEWELL MANUFACTURING COMPANY
Hartford 2, Connecticut

Please send complete details on Capewell Power Hack Saw Blades to:

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____



Lathe Makes Rough or Precision Cuts With Equal Effectiveness

Heavy-duty lathe, Model 4025, can be used with equal effectiveness on rough or precision cuts. It features a 75-hp headstock (peak load 100 hp) and 24 spindle speeds in true geometrical progression from 6 to 750 rpm. It has a capacity of 40 in. of swing over the bedways and 25 in. over cross-slide. A horsepower meter mounted on headstock enables operator to determine actual hp consumption.

Two levers control selection of feed changes on the totally enclosed gear box. There are 81 feeds, ranging from 0.005 to 0.351 in. per rev of spindle; 45 threads, from 1 to 30 in., can be cut. Two-speed tailstock provides a fast rate of movement when it is desirable to bring tailstock center up to work quickly, and a slow, powerful spindle movement for feeding tools.

Axelson Mfg Co, Div of U S Industries, Inc, 5947 Sheila St, Los Angeles 22, Calif

Micrometer Stage Permits Precise Measurements and Adjustments

Measured travel coordinate stage, 1 in. x 6 in., is designed primarily for use with company's lines of optical comparators, and is useful for precise measurements and micro - adjustments. Measured coordinate travel in the 1-in. x 6-in. range is provided by V-ways. Readings are made on a choice of micrometers—0.0005-in. increments or 0.0001-in. increments. Two 2.0000-in. and one 1.0000-in. size blocks are provided. Helix adjustment with locking device is standard equipment and provides rotational adjustment of 15° right and left of zero.

Stocker & Yale, Inc, Marblehead, Mass

Magnetic Conveyor Loads Tote Boxes In Close Quarters

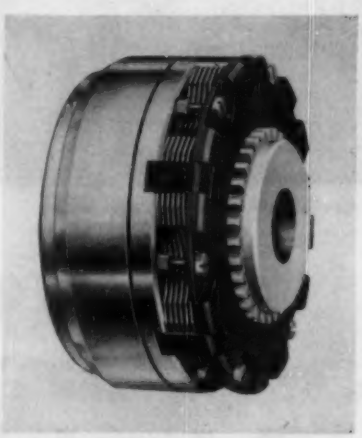
Space-Saver magnetic conveyor, featuring a special delivery extension, was developed to solve tote box loading in operations where it is necessary to locate box as close as possible to base of conveyor. The delivery section extends beyond base of conveyor.

Angle of incline is adjustable so that receiving end fits under the discharge chute of all standard presses. When angle is reduced, conveyor reach is extended so that the extension section may be centered over a tote box.

Homer Mfg Co, Inc, Dept 132, Lima, Ohio

Power-Safe brakes combine high torque and fast cycling with the ability to hold or stop a load if power fails. Four basic sizes are offered: power torque ratings range from 125 to 650 ft-lb, and fail-safe torque ratings from 33 to 205 ft-lb. Models are also available that provide the fail-safe feature with electrical release but without power braking.

Warner Electric Brake & Clutch Co, Beloit, Wis



Fawick Magnetic Clutch Engages And Disengages Rapidly

Magnetic clutch, Model SC, has many features, including comparatively short axial, and small radial dimensions, complete isolation of magnetic assembly from the integral mechanical parts, and compact, precision assembly of all components. It is furnished in stationary-field or brush types for either wet or dry operation.

Decay time and residual drag are said to be reduced to minimum. Device provides complete torque control under all rated conditions—through pushbuttons, relays, or limit switches. Easily adapted to modern machine tools, chuck comes in bore sizes from 2 to 13 in.

Fawick Airflex Div, Fawick Corp, 9919 Clinton Rd, Cleveland 11, Ohio

MORE from Allis-Chalmers—

Dependable Power for Industry

APPLY the many cost-saving features of Allis-Chalmers deep-rib motors in a variety of plant uses whatever your product or process.

Here's why these motors offer more dependability in industry after industry:

MORE Cooling Surface — Rib-type design provides reserve cooling capacity in dirty locations.

MORE Iron — Cast-iron frame and external parts assure greater rigidity and resistance to corrosion.

MORE Copper — Greater use of copper provides top electrical performance.

MORE Lubrication Provisions — Large grease reservoirs surround bearings. Provision made for in-service relubrication — important where moisture or corrosive vapors may contaminate grease.

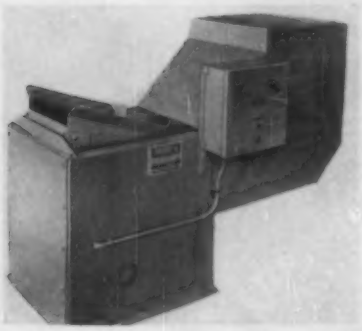
Rib-Type MOTORS 1 to 100 hp

Rib construction is available in Allis-Chalmers motors from 1 to 100 hp. As a new machinery component or as replacement, specify Allis-Chalmers. Contact your A-C district office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5293



Air Blast Separates Work From Chips In Ransohoff Separator

Work and chips produced by automatic screw machines are separated with up to 99% efficiency in this unit. Both work and chips are placed in the vibrating loading pan and then fed over a sloping screen and subjected to an air blast from below. The work, being heavier than the chips, drops through the air blast and is collected at end of the work discharge chute. Chips are blown upward and deposited under the hood where they can be collected in a container or carried away on a belt conveyor. Newly designed hood is said to eliminate air-blast back pressure, and prevents the chips from flying out of the vibrating loading pan.

The 5-hp blower motor and the ½-hp vibrator motor operate on 220/440 volts. Panel with 110-v controls is available.

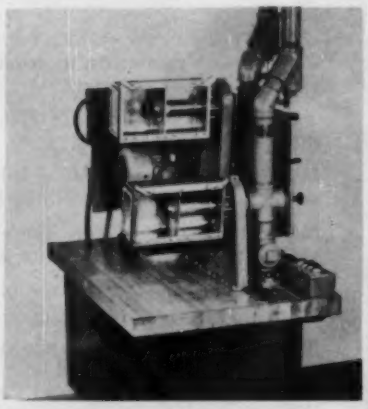
Ransohoff, Inc, North Fifth St at Ford Blvd, Hamilton, Ohio

Radial Drill Incorporates Pre-Selective Speeds

While Caser Model F25 (Italian) is running on one operation, speed for the next can be pre-set on direct-reading dial; feed dial can be turned to a new setting while tool is engaged. Feed-selector dial has built-in feed and speed chart.

Unit has 2-ft 6-in. arm length, 8-in. column. Drilling capacity is 1 in. in steel, 1⅜ in. in cast iron. Spindle dia at nose is 2⅜ in.; spindle travel, 8 in. Spindle has No. 3 Morse taper, 8 speeds from 205 to 2300 rpm, 3 feeds; motor is two speed, 1¾-2 hp. Vertical travel of arm and column is 23 3/16 in.; max distance from spindle nose to base, 46 in., min distance, 15 3/16 in. Overall dimensions are 55 in. long, 28 in. wide, 72 in. high.

Imported by Maserati Corp of America, 662 Main St, Westbury, Long Island, NY



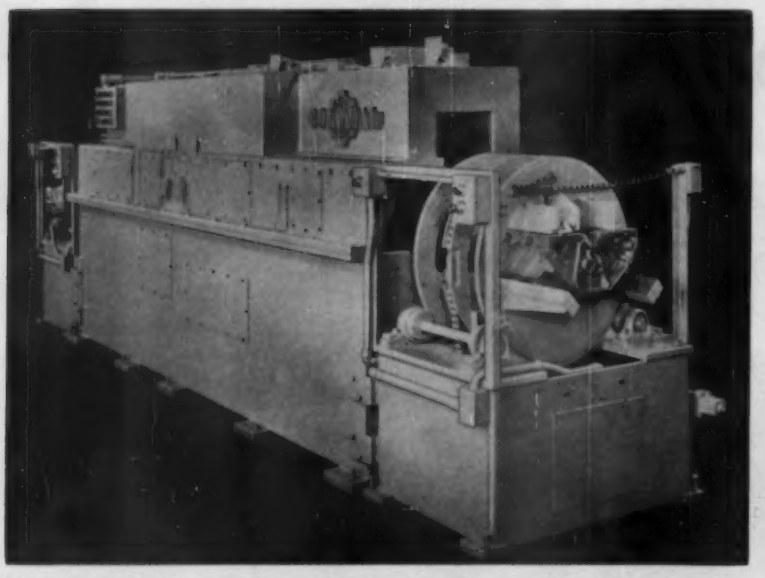
"Blow-Loading" Machine Loads Small Parts, Ups Production

Completely automatic loading of a wide variety of small parts is possible with new machine which operates on the "blow-loading" principle. Called Freeloader, machine feeds small parts to machining operations.

Air pressure introduced into an oscillating loading drum forms a vortex at each orifice of the collecting pattern. As drum oscillates, parts move back and forth through the vortices until they are drawn into place. When a part enters, it seals the orifice and will remain in place until air pressure is released. Loading will generally be accomplished in 30 sec to 3 min. Within reasonable limits, part size alone does not affect loading operation. A 1-in. No. 10 screw loads as easily as a sub-miniature electronic terminal.

Three models are available: Model A-3, double drum, individual drives; Model A-2 (illustrated), double drum, single drive; and Model A-1, single drum, single drive.

Whitso, Inc, Blow-Loading Div, 9330 Byron St, Schiller Park, Ill



ENGINE-CYLINDER BLOCKS are broached in this tunnel-type broaching machine. Parts are automatically fed to machine through turnover positioning unit for one-pass overhead broaching by a hydraulic traveling ram which removes 0.025 in. of stock. In one application for broaching 10 bearing surfaces of a cast-iron V-8 block an automatic cycle time of 29.5 sec was obtained with a 6-ton, 54-in. stroke model. Cutting speed is 30 fpm—*Colonial Broach & Machine Co, PO Box 37, Detroit 13, Mich

Will PRODUCTION LAPPING Prove Beneficial in MY Plant?

Get The Answer With

YOUR OWN FREE ANALYSIS

FROM THE *Lapmaster*® TECHNICAL SERVICE

It's easy to prove to yourself whether production lapping will benefit your own manufacturing process...improve your product performance. Just send a few sample parts with surface finish specifications and production requirements to the Lapmaster Technical Service.

We'll test run them in our experimental lapping laboratory and furnish you with a full production report. This complete special analysis will give everything you need to determine how profitable the Lapmaster will be in your plant. Lapped samples will enable you to positively check product improvement.

More than 80% of the successful Lapmaster installations now in daily operation started with just such an analysis . . . and in the majority of cases, the results have shown substantial savings. However, if the application is not practical or profitable for you, we are frank to report it.

View of our experimental lapping laboratory showing some of the equipment available to test run your sample parts.

Our lapping laboratory is also equipped with the finest checking instruments to insure an accurate report of every experimental job.

TECHNICAL BULLETINS FOR YOU—If you want additional information immediately, write for these latest technical bulletins on producing and measuring precision flatness and finish.

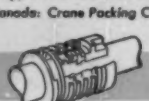
WHAT YOU CAN EXPECT FROM A LAPMASTER

- Surface finishes of 2 to 3 RMS and surface flatness within tolerances of .0000116" with absolute uniformity piece after piece.
- No production bottlenecks frequently caused by other lapping methods.
- No downtime for truing lap plate . . . conditioning rings automatically keep plate flat and true.
- Product performance and quality improved . . . rejects cut to a minimum . . . inspection costs reduced.

Crane Packing Company, 6436 Oakton St., Morton Grove, Ill. (Chicago Suburb)
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

John Crane

MECHANICAL PACKINGS



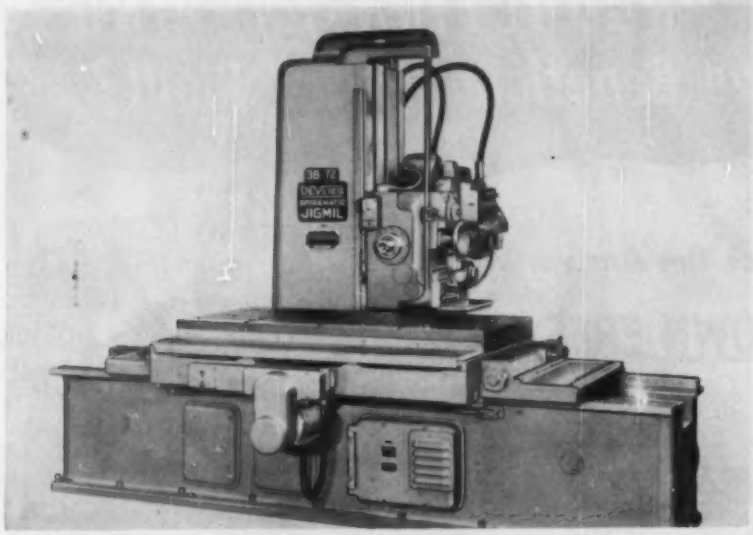
SHAFT SEALS

TEFLON PRODUCTS

LAPPING MACHINES

THREAD COMPOUNDS

CRANE PACKING COMPANY



Boring and Milling Machine Has Spindle Speeds up to 1600 rpm

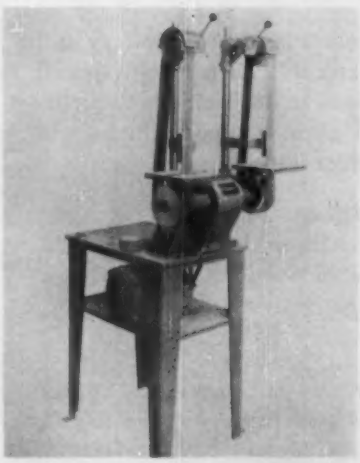
Spiramatic Jigmil, Model 3B-72, has a 3-in.-dia spindle bar, 36-in. vertical travel, 72-in. horizontal travel, and a 72 x 30-in. table. Machine features automatic positioning for both table and spindle, automatic speed-changing mechanism for the spindle, and an automatic trip mechanism for the spindle bar feed. Spindle is equipped with power-operated tool-lock mechanism for locking and releasing boring bars and milling cutter adapters.

Jigmil Duplitrol system, in conjunction with the automatic positioning cycle, provides a means for jigless boring all types of work on a production basis, thereby eliminating expensive boring jigs. Machine has spindle speeds from 25 to 1600 rpm, bar feeds ranging from 0.002 to 0.020 ipr, and a rapid-traverse bar feed rate (manual) of 90 ipm. Milling feed rates range from 0.5 to 36 ipm, with two rapid traverse rates, 50 and 150 ipm. Floor space is 15 ft 4 in. by 10 ft 10 in.; over-all height is 8 ft 4 in.

DeVlieg Machine Co, 450 Fair Ave, Ferndale, Mich

Torque control device is mounted between wrench and socket. When nut or bolt is tightened, device will automatically disengage when predetermined torque is reached. Unit comes in three sizes: 1⅜-in. dia x 2 in. long, range 0-25 in. lb; 2⅜ x 2½ in., 25-80 in. lb; and 3 x 3 in., 80-200 in. lb.

Overload Control Co, 260-11 Langstron Ave, Glen Oaks, LI, NY

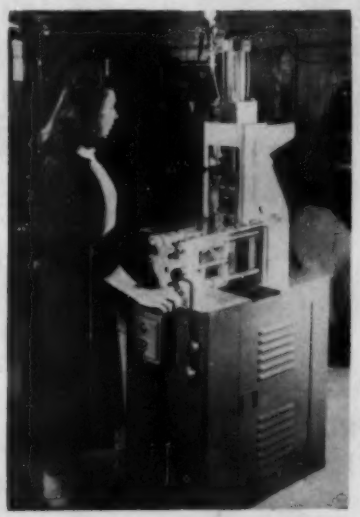


Abrasive Belt Machine Grinds, Polishes, and Deburrs

Model 50 grinder combines all the various methods of abrasive-belt finishing—free belt, contour, plate, and contact wheel, into a unit which is recommended for ferrous and nonferrous metals, as well as plastics, ceramics, wood, rubber, and glass.

Each belt can be used in the vertical or horizontal position. Belts are from ½ to 2½ in. wide and from 42 to 60 in. long. Unit, which can be furnished with built-in dust collector, is powered by a 1- or 2-hp motor through a V-belt drive.

Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich



Plastic Molding Machine Produces Small Products Economically

Operating principle of Mini-Jector units incorporates small lowcost, parting-line sprued molds of 1/3 to 1-oz capacity. Prices start at $875 (¾-oz); mold blanks at $37.50. Wide variety of small plastic products and parts can reportedly be developed and produced by unskilled personnel.

Machine will mold any thermoplastic including nylon; up to 30,000 psi is possible on material with hydraulically operated model. Units can also be used for encapsulating of wires or cables into plastic plugs. Air or hydraulic power models are available with lever or pushbutton controls.

Newbury Industries, Newbury, Ohio

STRAIGHTEDGE COUNTERBALANCE, designed for use on steeply inclined boards or vertical boards, can be used with any of company's straightedges. Fastening units can be attached to edge of table with screwdriver. Rod is supplied in 44-in. length, and may be cut to length—*Mayline Co, 619 N Commerce St, Sheboygan, Wis*

SIP

Guaranteed Accuracy

More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

NORTHERN ORDNANCE INCORPORATED

TEMCO AIRCRAFT CORPORATION

American Optical

Rheem AVIATION PLANT

National

Avey

SPERRY

IBM

CANADAIR — AIRCRAFT MANUFACTURERS —

Thompson Products, Inc.

MOTCH & MERRYWEATHER

Ford

LOCKHEED

Hamilton Watches

CRENDA ENGINES

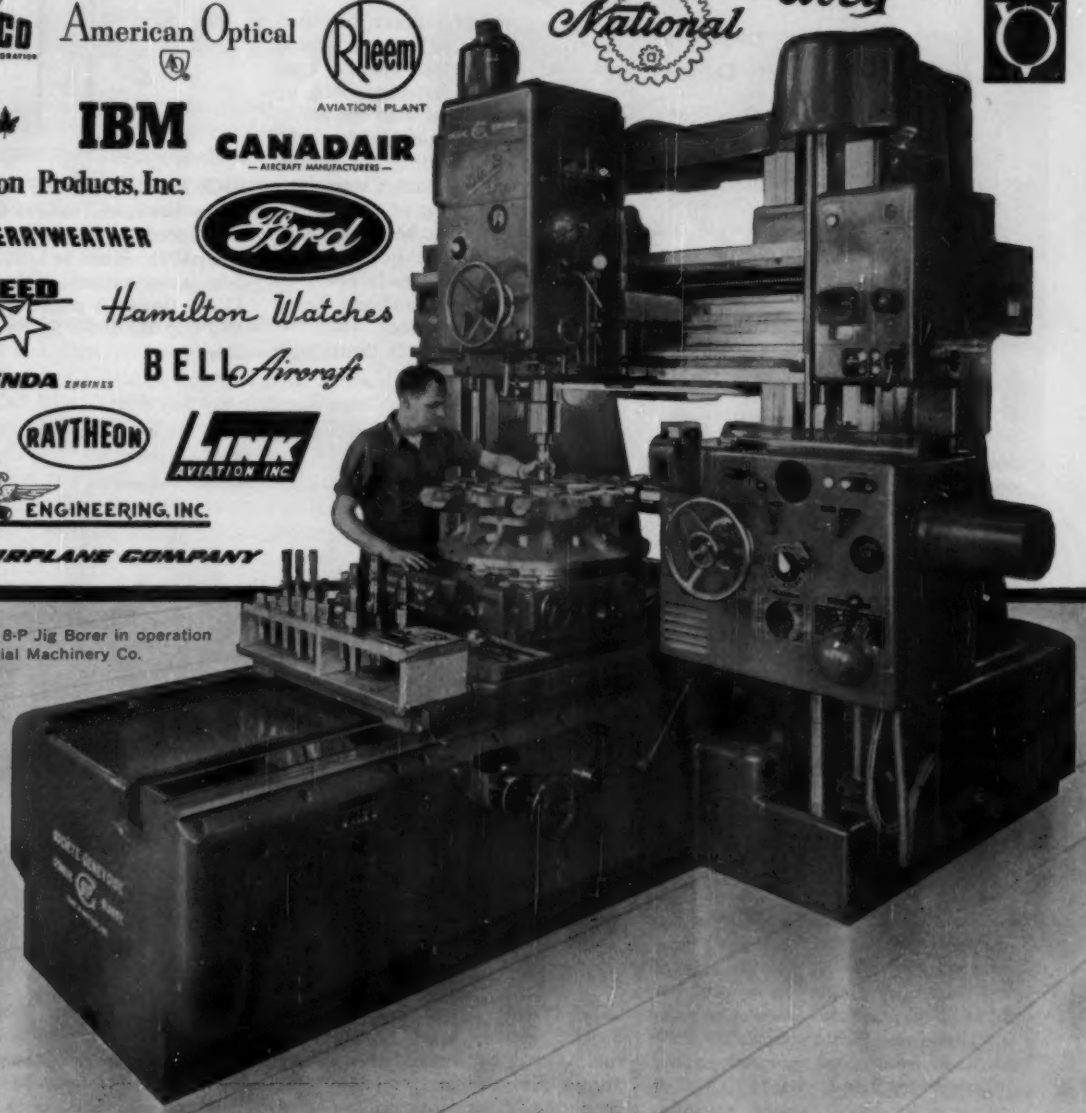
BELL Aircraft

RAYTHEON

LINK AVIATION INC.

Merz ENGINEERING, INC.

BOEING AIRPLANE COMPANY

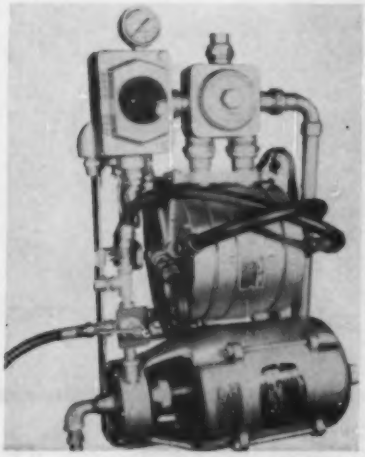


SIP HYDROPTIC 8-P Jig Borer in operation at Hartford Special Machinery Co.

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

100 EAST 42nd STREET, NEW YORK 17, N. Y.

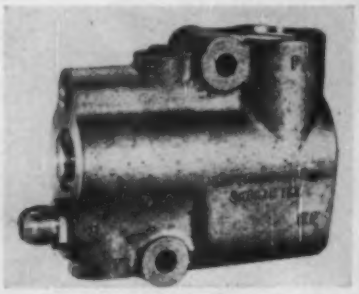


Hot Spray Heater Has Finger-Tip Temperature and Viscosity Control

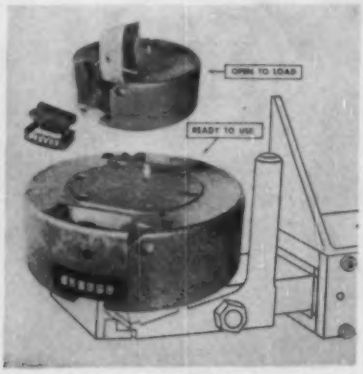
Viscomatic hot spray heaters feature a Dial-a-Matic temperature and viscosity control which can be adjusted even while the unit is operating. Temperature control at any desired level between 90 and 180 F is accomplished with the finger-tip control. All standard paint materials, including lacquers, enamels, vinyls, epons and a wide range of oil paints, are handled in this spray unit.

Unit is said to combine three features which are unique in this field: a maintenance - free centrifugal pump, a "coil-less" heat exchanger, and the Dial-a-Matic control. Booklet on hot spraying is offered free.

Spee-Flo Co, 720 Polk Ave, Houston, Texas



FLOW DIVIDER, Model 1088, has adjustment device which can vary flow on controlled flow side to the rate of flow in proper proportion to meet demand of job. It also features a built-in relief valve that bypasses oil back to sump when peak pressure setting of secondary flow is reached. Unit is designed for high pressures on large equipment—*New Products Corp, 3636 Oakton St, Skokie, Ill*



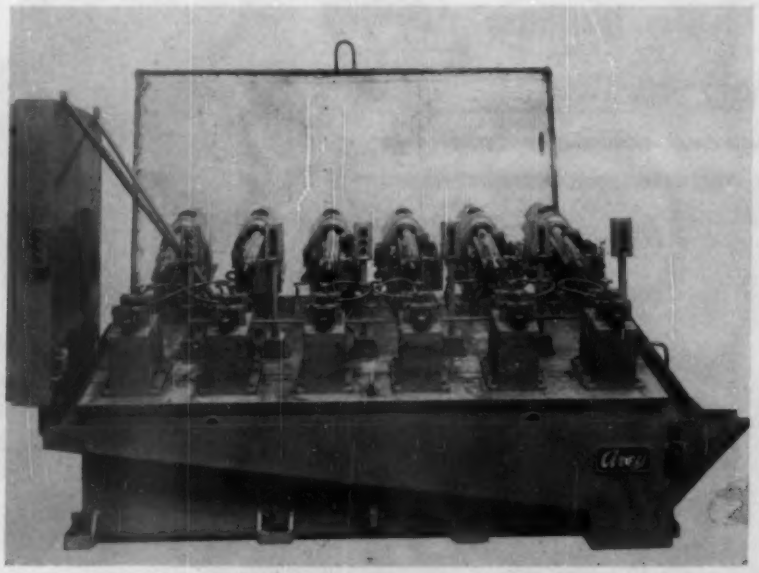
Rotary Marking Device Speeds Stamping of Hot Metal Pieces

Rotary hot metal marker has two pockets, located 180° apart, which hold company's quick-change type cartridges. Type cartridges can be inserted and removed with one hand; brake stops wheel quickly for safe, sure cartridge handling. It is not necessary that each pocket stamp the same mark. Location of pockets allows an impression to be made every 18 in., or if only one pocket is set with type a mark is made every 36 in., on hot metal products being conveyed past the wheel.

Automatic operation is timed with the material passing by; either air or hydraulic cylinder powering the ram. Outside edge of wheel can be machined to better suit a curved product. Wheel is 12 in. in dia x 4½ in. thick, and has sealed bearings.

Pannier Corp, 104 Sandusky St, Pittsburgh 12, Penna

MICRO-HEIGHT GAGE with 4-in. capacity has same features as previously announced 2-in. model (AM—Oct 24 '55, p192). Risers in 1, 2, 3, 4, 5, and 6-in. sizes extend unit's capacity to 11 in. Device is priced at $57—*Greist Mfg Co, 485 Blake St, New Haven 15, Conn*



CONNECTING RODS FOR DIESEL ENGINES are drilled on 6-spindle Aveydraulic machine which has 12-in. ram travel, rapid traverse feed and rapid return, and hydraulic feeds. New feature on machine is company's Metric Torque-matic which provides automatic, calibrated torque to prevent drill breakage. Control device withdraws drill for chip clearance whenever it becomes loaded during deep hole drilling—*Avey Drilling Machine Co, Cincinnati 1, Ohio*

ANNOUNCING...

A Complete LINE OF END MILLS FROM CHICAGO-LATROBE

Users of Chicago-Latrobe Drills and Reamers are accustomed to tools of finest quality . . . tools that give what customers call "extra cutting mileage." Now the C-L line has been broadened to include a complete stock of End Mills of the same superb quality. Ask for them on your next order.

Sold Through Industrial Distributors

A C-L Distributor in your area is now stocking Chicago-Latrobe End Mills. Call him. You'll get exceptional service. He will deliver promptly . . . he will provide competent technical help when it's needed. If your problem is unusually difficult, your distributor can call on a skilled Chicago-Latrobe Service Engineer for special help.

WRITE FOR CATALOG AND TECHNICAL MANUAL

The Chicago-Latrobe End Mill Catalog offers complete listings, plus technical information to make your job easier. Free on request.

DOUBLE CIRCLE TOOLS

CHICAGO-LATROBE

416 W. ONTARIO STREET, CHICAGO 10, ILLINOIS

Offices and Warehouses in:
NEW YORK • DETROIT • CHICAGO • LOS ANGELES

DRILLS • REAMERS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS • GUN DRILLS • SPECIAL TOOLS

Chicago-Latrobe,
416 W. Ontario St., Chicago 10, Ill.

Please send me free copy of your Catalog and Technical Manual on End Mills.

Name_____

Firm_____

Address_____

City_____ State_____

Vertical Electrospark Machine Pierces, Drills, Trepans

Ex-Cell-O's Style 243-6 vertical Electrospark machine uses company's previously announced Method X process (*AM*—Dec 5 '55, p188) to pierce, drill, trepan, tap, or sink a cavity in any material that is an electrical conductor. Because cutting action creates no tool pressure on the workpiece, the only clamping pressure needed is that required to make a good electrical contact.

In the process, electrical impulses pass between the tool (negative electrode) and the workpiece (positive electrode), energized by a high current. Both tool and electrode are submerged in a dielectric bath.

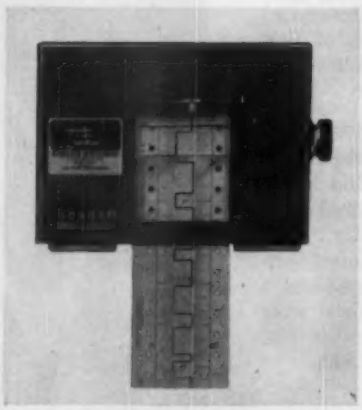
In addition to machining hard materials such as carbides, machine will cut a variety of regular and irregular shapes. Tools can be made from low-cost sheet brass, tubing, or rod. Steel or other conductors can also be used for tool material.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

Flux-Dip Brazing Technique Joins Complex Aluminum Assemblies

Flux-Dip brazing, a new technique for joining complex, multi-joint aluminum assemblies in one operation is said to eliminate many drawbacks of hand brazing. Controlled uniform heating eliminates warp and distortion; filler alloy penetrates all joints; solder build-ups are eliminated. Method has been used for brazing such aluminum assemblies as waveguides, antennas, and chassis.

Waveline, Inc, Caldwell, NJ

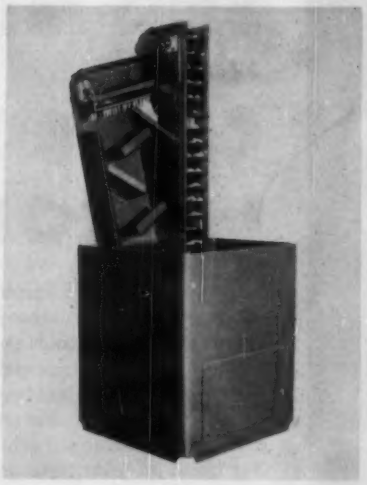


Instrument Gives Continuous Record of Operations

Model SR Recorder-Totalizer is said to be the ideal instrument for the accurate accumulation of data on the operation of any machine, process, or system in the plant. It features a continuous sprocket-driven strip chart which maintains positive, accurate timing. Each chart roll contains 250 lineal feet of printed chart; markings are available for speeds from 1 in. per hr to 10 in. per min.

An elapsed-time meter registers accumulated "on" or productive time. The instrument can be provided with an operations counter instead of, or in addition to the time totalizer. The stylus does not use ink and is said to produce a clearly defined line. A transparent window which allows viewing of the chart can also be lifted, providing sufficient area for making notations directly on chart. An external knob is used to adjust chart to time of day. Price is $65. Bulletin RT191-601 available.

Standard Instrument Corp, 657 Broadway, New York 12, NY



Elevating Hopper Feeds Sliding, Rolling, or Headed Parts

Elevating hopper, Model 2000, feeds sliding, rolling, or headed parts into production machines at predetermined rates. In-process parts are picked up from 6-cu-ft storage hopper by moving, cleated-steel belt conveyor and elevated to an adjustable roll orienting mechanism. Oriented parts are then fed into work chute to production machine. Non-oriented parts are fed back to hopper. Feed rate is controlled by variable-speed conveyor.

Unit is electrically controlled, has a 36-in. loading height, and will handle rolling parts up to 2⅜ in. in dia and ⅛ in. in length, sliding parts of 3/16 to 1¼-in. dia and 3½-in. length, and headed parts of 3/16 to 1¼-in. head dia and 3½-in length. Bulletin available.

Production Feeder Corp, 3130 Johnnycake Ridge Rd, Mentor, Ohio

Tapping hammers are available in brass, bronze, beryllium, or copper, and are designed for the toolmaker, shop, or craftsman who desires a metal non-sparking hammer. New line is available with head sizes from ½ through 5 lb.

Hunter Tool Co, PO Box 564, Whittier, Calif

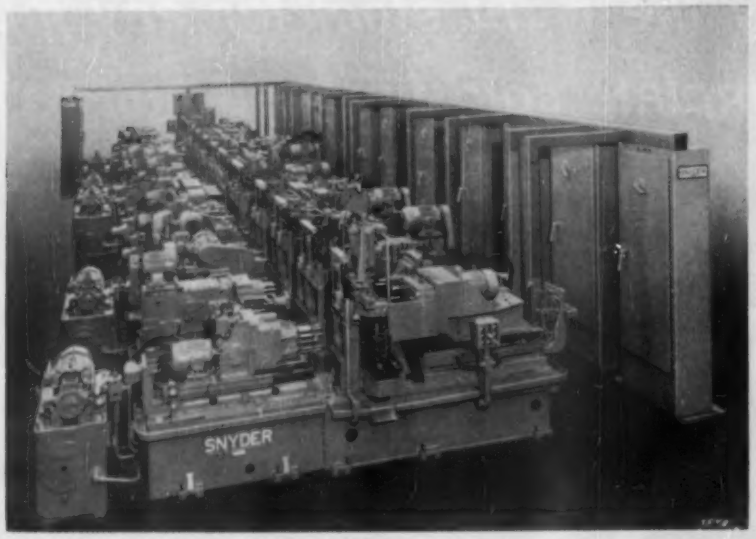
Pick exactly the right steel for any job from J & L's complete cold finished line

steel whorl production increased 22% with J & L LEADED STEEL

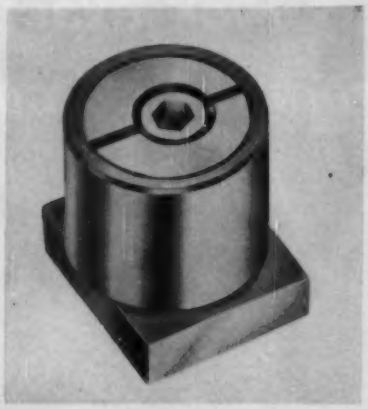
Superior uniformity and machinability of J & L 1113 Leaded Steel enabled this manufacturer to increase production from 110 to 140 pieces per hour. J & L Leaded Steels give you higher cutting speeds, longer tool life, improved finishes. Call your local distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

Jones & Laughlin
. . . a great name in steel

MACHINING PERFECTION always starts with the right steel



SLIDING GEAR TRANSMISSION CASES are drilled, spotfaced, chamfered, reamed, line reamed, tapped, milled, and bored on 53-station, 62-ft-long machine. Machine is hydraulically operated, electrically controlled, has three in-process gaging stations, and turns out 80 cast-iron gear cases per hr—*Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich*



Eccentric Fixture Key Provides Fast Alignment of Holes and Slots

Ace eccentric fixture key offers zero concentricity in a matter of seconds for lathe fixtures mounted on slotted faceplates. Unit is said to provide fast, simple, accurate alignment of holes and slots, quickly correcting any misalignment of faceplates and milling fixtures up to 1/16 in. Interchangeable keys adapt fixture to any machine having standard-width key slots.

Eccentric fixture key is pressed into milling fixture from bottom; fixture is then mounted on machine. By loosening Allen lockscrew, adjusting the eccentric with screwdriver, then clamping fixture in place and tightening lockscrew, the fixture is quickly aligned.

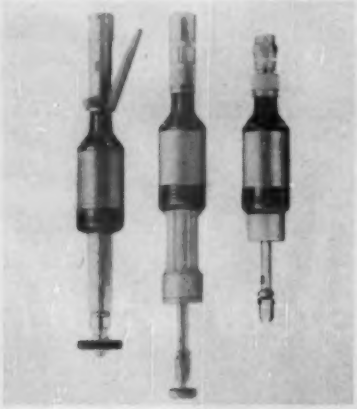
Ace Drill Bushing Co, Inc, 5407 Fountain Ave, Los Angeles, Calif

Light-Duty Fork-Lift Truck Has Short Turning Radius

Short turning radius and extra maneuverability are said to be outstanding features of electric fork truck which is available in two models: FTA-50, (illustrated), with 5000-lb capacity, and FTA-70, with 7000-lb capacity.

Model FTA-50 has 77¾-in. turning radius, 41-in. over-all width, and length, without forks, is 79⅝ in. Model FTA-70 has 86¾-in. turning radius, 44½-in. over-all width, and length, without forks, is 89¾-in. Standard lift height is 120 in.

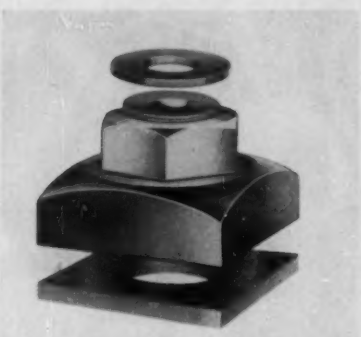
Baker-Raulang Co, 1250 W 80 St, Cleveland 2, Ohio



Small-Wheel Air Grinders Have 50% More Power for Tough Jobs

Rotor M1170 Series small-wheel air grinders are available in three models: M1172 (left) has snap throttle, wheel arbor, and straight wheel; M1171 (center) has standard spindle, twist throttle, and ¼-in. collet; M1170 (right) has sleeve throttle, standard spindle, and ¼-in. collet. Main features are: 50% more power than previous models; centrifugal governor on all speeds (8000 to 17,000 rpm); quiet operation; versatility through choice of speed, spindle, and arbor—45 different tools can be made.

Rotor Tools Co, 26300 Lakeland Blvd, Cleveland 32, Ohio

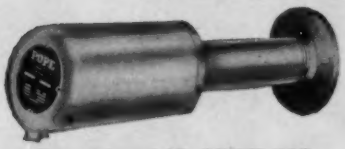


LEVELING JACK, Style JS, supports up to 20 tons and is raised and lowered by means of adjustable nut. Concave spherical radius in lift screw and aligning disk compensate for floor slope. Device is available in 12 models, ranging in height from 1¾ to 3¾ in. with a leveling adjustment of ⅜ in.—*Enterprise Machine Parts Corp, 2731 Jerome Ave, Detroit 12, Mich*

POPE engineers and builds 20,000 DIFFERENT MOTORIZED AND BELT DRIVEN SPINDLES

one of which may be just the one to LOWER YOUR PRODUCTION COST

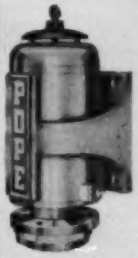
Here are only a few representative Pope Precision Spindles:



FOR SURFACE GRINDING

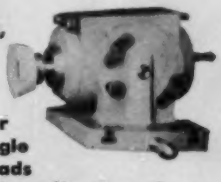
POPE 1, 2 and 3 HP Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with double row cylindrical roller bearings of enormous capacity for superior performance and long life, plus separate thrust bearings for no endwise movement of the shaft.

FOR HEAVY DUTY MILLING AND GRINDING

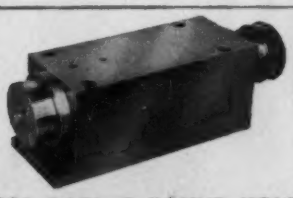


POPE ¾ to 100 HP Direct Motorized Spindles operate in any position — flanged or tapered noses — equipped with super-precision, double-row roller bearings and preloaded ball thrust bearings. Top quality performance is assured on skin milling, grinding, boring and other operations as well as milling.

FOR TOOL AND CUTTER GRINDING



POPE Super-Precision 1 HP, 3600 RPM Motorized Tool and Cutter Grinder Clearance Angle Swivelling Heads provide angular adjustment in a vertical plane. They pay for themselves in time saved. Cup wheels can be used for practically all clearance angles.



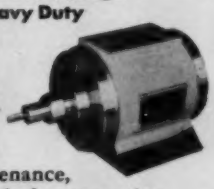
FOR BORING ROUND HOLES WITHIN MILLIONTHS OF AN INCH

POPE Heavy Duty Boring Spindles assure smooth, chatter free, continuous high production of accurate parts. Belt driven or motorized, in a wide range of horsepowers and speeds.

FOR INTERNAL GRINDING

POPE Precision Internal Grinding Spindles have the super-precision bearings to withstand both axial and radial loads and to produce better finished ground holes. Their ability to take heavy cuts means increased production. Wheel life is increased, too. For Bryant, Cincinnati, Excello, Heald, Landis and Norton Grinders.

FOR HIGH CYCLE GRINDING AND MILLING



POPE Super-Precision, High Frequency, Heavy Duty Spindles are available for speeds up to 100,000 RPM. They are unequalled for low cost maintenance, long life, trouble-free operation and rugged ability to cut metal fast.

Send us your specifications and get prompt quotations on the one best Spindle for you out of the 20,000 different Precision Spindles that bear the name "POPE."

No. 120

POPE®

ENGINEERS AND BUILDS STANDARD AND SPECIAL PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

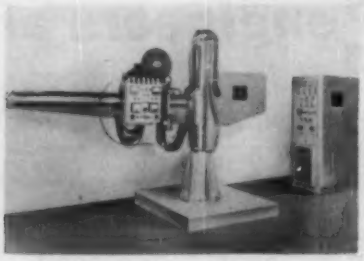
POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

Riveting Machines Are Designed For Special Purposes

Three riveting machines have been designed for special applications: Model FS, a multi-spindle pneumatic machine for production operations; Model FM, pedestal-type unit for riveting in deep channel sections and hard-to-reach areas; and Model RT-52, a fully automatic dial-fixture machine for light work. The multiple-spindle pneumatic model (illustrated), available with either pedestal or bench-type base, can set tubular steel rivets ranging from ⅛-in. dia and 9/16 in. long down to 0.06 in. dia and 3/32 in. long. Currently being built with a 4-spindle head, it can be made with two to six or more heads, each fed by an automatic rotary hopper.

Milford Rivet & Machine Co, Milford, Conn



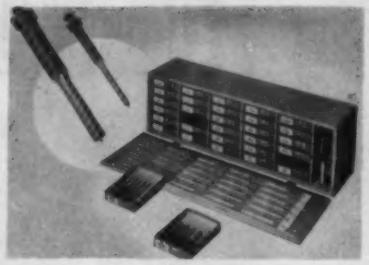
Welding Head Manipulator Accepts Heliweld and Aircomatic Heads

Air Reduction's new welding head manipulator and console control for longitudinal and circumferential welding are designed to accept either Heliwelding or Aircomatic heads. Manipulator, of all-welded construction, is especially designed for welding applications on aircraft jet engine components and similar intricate parts.

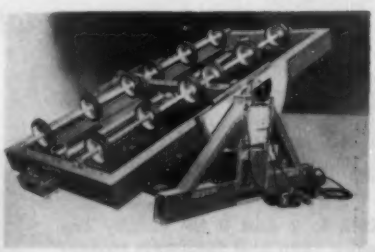
Control console provides all necessary controls for complete programming of the welding operation. Electronic timers are provided for sequence control. Unit includes welding power source with current slope control, accessories for control of shielding and back-up gases, and a self-contained water-circulating unit.

Manipulator and control console can be designed and constructed to meet requirements of any production line application.

Air Reduction Sales Co, Machine Welding Dept, 150 E 42 St, New York 17, NY

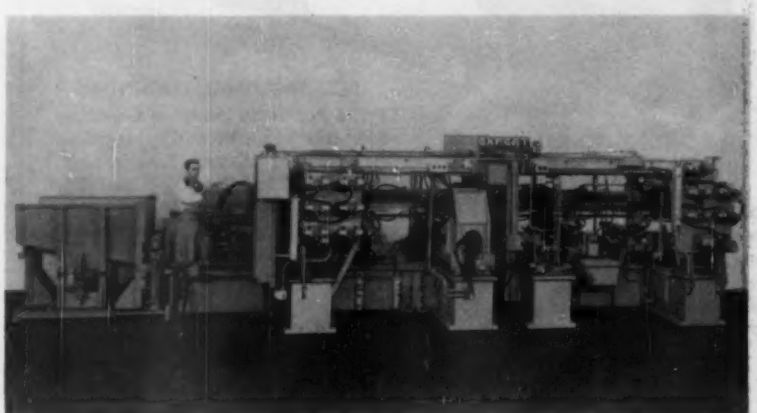


PUNCH BLANKS, five each of 30 different sizes, are made of A2 tool steel, R_c60-62, and can be altered to any shape without loss of hardness. Blanks come in 21 x 5½ x 6-in. wooden case, and are supplied in three assortments —basic, heavy-duty, and close-spacing —*Dayton Perforators, Inc, Dept 15, 1336 Stanley Ave, Dayton 4, Ohio*

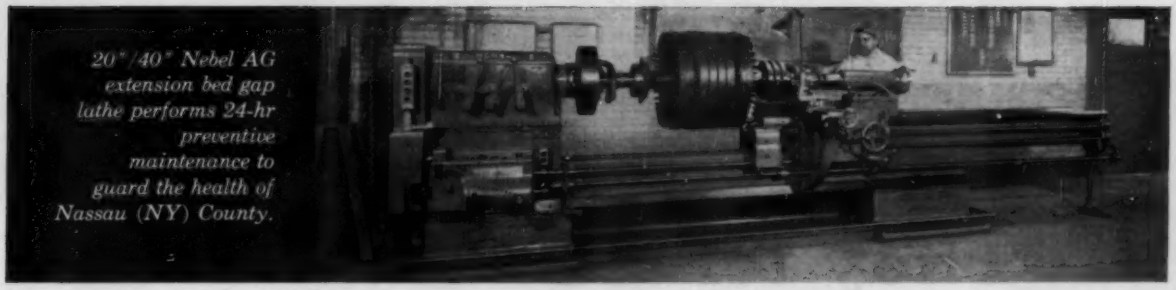


TILTING TURNING ROLLS are used to position tanks for welding flanged heads to body. Unit can be tilted up to 45° in either direction; longest practical length of tank is 20 ft. Rolls are available with capacities from 5000 to 30,000 lb—*Aronson Machine Co, Arcade, NY*

AIR HAMMER, called Bantam Bully, has metering trigger that allows operator to control speed from 0 to 13,000 blows per min. Unit is 6 in. long, weighs 20 oz, and uses 6.5 cfm air at 90 psi. Scaling, chiseling, peening, metal cutting, star drilling tools are among 24 different tools available—*Superior Pneumatic & Mfg Co, 4758 Warner Rd, Cleveland 25, Ohio*



AUTOMOTIVE STEERING COLUMNS are machined, welded, assembled, and tested on this 7-station in-line Weldmation processing machine. Unit assembles and welds flange to one end of steel tube, performs three separate machining operations on other end of tube, and tests finished column assemblies at production rate of 400 units per hr. Adjustments are provided for handling two different tube and flange components—*Expert Automation Machine Co, Div of Expert Die & Tool Co, Inc, 17144 Mt Elliott Ave, Detroit 12, Mich*



20"/40" Nebel AG extension bed gap lathe performs 24-hr preventive maintenance to guard the health of Nassau (NY) County.

Nebel lathes essential when there's

NO TIME FOR DOWNTIME

"The health of our community depends to a large degree upon the dependability and the great, adjustable capacity of our Nebel extension bed gap lathe," states Mr. Anton E. Sparr, superintendent, Nassau County Sanitation Disposal Plant.

"It has served us without interruption . . . and the almost unlimited swing and center distance capacity has proved so valuable that it has returned a third of the purchase price in less than two years.

"And by doing our own maintenance machining, we eliminate in-transit damage to delicate and valuable parts (pump rotor value: $3,000), have closer control and save valuable time."

This dependable performance and adjustable swing and center distance capacity is available in three different Nebel models . . . see specification chart below. Shouldn't these modern, pay-for-themselves facilities be on the job in your plant? For complete information, write today for descriptive bulletins. **Nebel Machine Tool Co., 3407-A Central Parkway, Cincinnati 25, Ohio**

	Swing over ways	Swing thru gap	Width of gap	Bed length minimum	Center Distance gap opened	Spindle speeds range, rpm	Motor Recommended
Imperial 20"/40"	24½"	42"	32"	8 ft.	5' 4"	11-666 or 16-1000	15-20
AG series 20"/40"	22½"	40"	24"	6 ft.	4' 0"	9-280 or 16-500	7½-10
G series 28"/50"	29"	52"	41"	10 ft.	7' 5"	5-230 or 10-460	20-25

†increasing in increments of 2 ft.

4500-lb pump rotor, 32" in diameter, swings with room to spare in the wide, deep gap of this Nebel extension bed gap lathe.

BEFORE THEY COME TO FAIR STREET

They tell us we are exaggerating . . .

"Accurate holes in precise locations are the key to the JIGMIL Technique. Through a high degree of accuracy, speed and push button control, this technique introduces an entirely new philosophy of duplicate production – a method involving substantial savings."

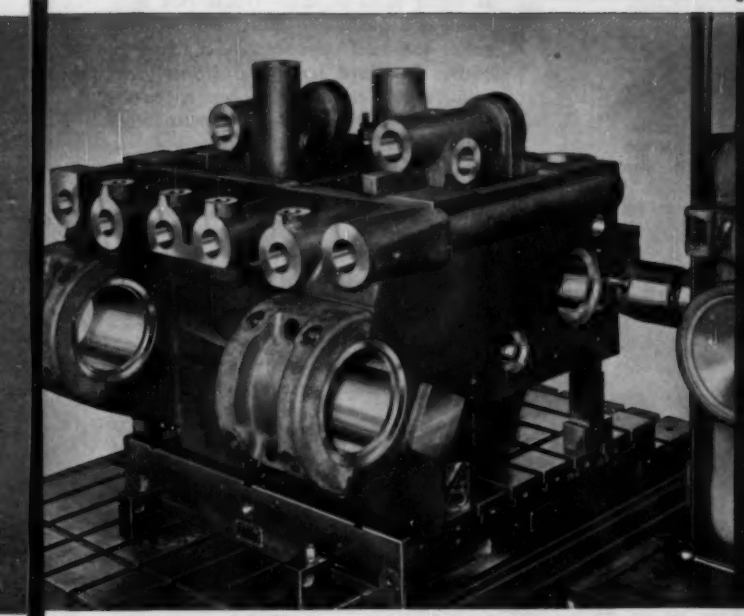
If we sat down across the desk from you and explained what we had done with the JIGMIL Technique in boring and milling parts similar to your own, the chances are you wouldn't believe us. Few people do. But we don't blame them. The JIGMIL Technique sounds too visionary. Savings seem too great. *Although simple, the* JIGMIL *Technique is so revolutionary that you have to see it to believe it.* Will you come to Fair Street (home of the JIGMIL) and see for yourself? We would be delighted to have you.

C. B. DE VLIEG

DE VLIEG MACHINE COMPANY 450 FAIR STREET

Some of Our Users in the Machine Tool Industry

Avey Drilling Machine Co.
Barber-Colman Company
E. W. Bliss Company
Brown & Sharpe Mfg. Co.
Buhr Machine Tool Co.
Cincinnati Milling Machine Co.
Cincinnati Shaper Co.
Cleveland Hobbing Machine Co.
Cross Company
Ex-Cell-O Corporation
Foote-Burt Company
Gallmeyer & Livingston Co.
Gisholt Machine Co.
Gleason Works
Gould & Eberhardt, Inc.
G. A. Gray Company
Hamilton Tool Co.
Heald Machine Co.
Ingersoll Milling Machine Co.
Jones & Lamson Machine Co.
Kearney & Trecker Corp.
King Machine Tool Div.
Landis Tool Co.
Landis Machine Co.
R. K. LeBlond Machine Tool Co
Lees-Bradner Co.
Lodge & Shipley Co.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error . . . even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL ECONOMY

At one setting! On four sides! Without the aid of jigs! This horizontal broaching fixture was completely machined—*bored* and *milled* to precise limits of accuracy. The JIGMIL Technique requires a minimum of tooling and technical skill to produce precision parts.

Micromatic Hone Corp.
Monarch Machine Tool Co.
Moore Special Tool Co., Inc.
National Acme Co.
National Automatic Tool Co., Inc.
National Broach & Machine Co.
National Machinery Co.
Oilgear Co.
Sheffield Corporation
Snyder Tool and Engineering Co.
Sundstrand Machine Tool Co.
Van Norman Machine Company
Warner & Swasey Company

WILL YOU BE THE NEXT TO VISIT FAIR STREET

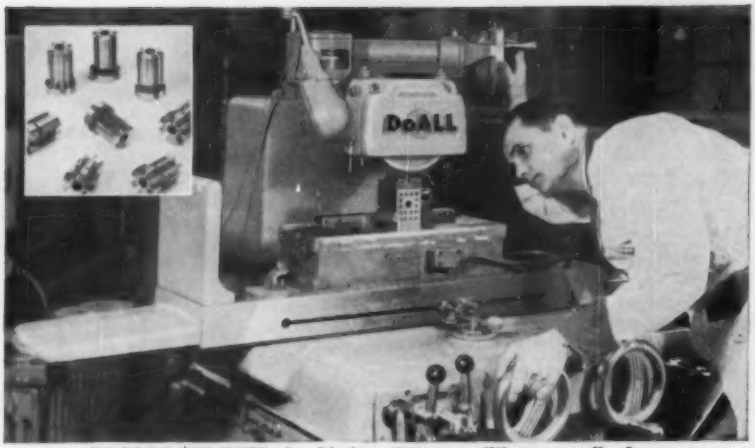
Our newest catalog will help you decide. May we send it?

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES IN PRECISE LOCATIONS

FERNDALE • DETROIT 20



TOOLS LIKE THIS give birth to TV sets millions can afford . . .

THE FACTS OF the better LIFE

THE TRUTH is the stork doesn't bring television sets . . . or any of the other material benefits of modern living.

They are born in factories, mothered and fathered by tools. The more and better the tools, the more and better their offspring—freezers, food and fishing tackle . . . cameras, cashmeres and canoes. This is the stuff good living is made of. And tools are its only source.

The birth of a TV set illustrates the principle. Machines that produce plastic sockets for the vacuum tubes require dies of extreme precision. But the cost of grinding the dies was exorbitant—until a machine employing the "Cool-Grinding" principle was employed. Now a die manufacturer produces more in two days than he formerly did in five. And the grinding wheels last four times as long. This is one of the reasons TV sets are priced within the reach of millions of people.

It takes a lot of tools to supply a growing abundance of goods and services for a growing population. Every year at least 40 billion dollars must be saved and invested for this purpose—because the stork doesn't bring the tools, either. It takes 25 billion dollars just to maintain existing tools. Another 15 billion is needed to add to the tool supply—5 billion to provide 400,000 new jobs per year and 10 billion to increase productivity per employee a conservative 1½% per year.

The cost of the dies used in making plastic sockets for TV sets was slashed by DoALL "Cool-Grinding"—a patented process wherein coolant flows through the grinding wheel and out at point of contact with the work. Faster grinding, greater accuracy, smoother finish, greater visibility and longer wheel life are secured.

These are the facts of the better life everybody seeks.

In the realm of tools, the DoALL Company offers industry sawing and surface finishing machines, precision measurement equipment and cutting tools... all designed to produce products better at lower cost.

Reprints of this series on economics available for your employees.

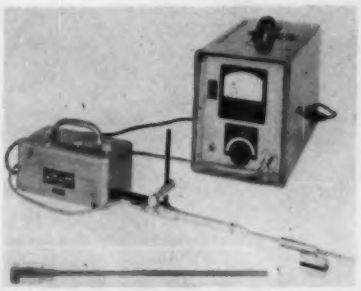
FREE FILMS—sound, color films "Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding" are available for group showings. Address requests on company or school letterheads.

The DoALL Company

Des Plaines, Illinois

38 Local Sales-Service Stores

E-46R



SURFACE ROUGHNESS GAGE, Profilometer Type LC Tracer, is designed to measure surface roughness in holes as small as ¼-in. dia. Tracer has a single skid positioned directly back of point, and must be moved by a monotrace. Standard length of tracer is 6 in.; other lengths available on request. Bulletin LT 131—*Micrometrical Mfg Co, 345 South Main St, Ann Arbor, Mich*

CONCENTRICITY GAGE can be used on drillpresses, boring tools, and lathes; in toolrooms and inspection operations; and in all positions because it is attached magnetically. Lateral adjustment mechanism for indicator is mounted in magnetized holder. Gage, complete with box, sells for $97.50—*Clark Engineering and Mfg Co, 1820 Layard Ave, Racine, Wis*

Servo-Type Hydraulic Valve Offers Precise Flow Reversal

Repetitive, precise reversal of flow to work element; automatic cycling; hydraulic lock, with locked-in, equal opposing pressures; free-wheeling with no pressure or flow restrictions are the basic characteristics of Ser-Van, a servo-type hydraulic valve. Valve was developed as a positive, flow-responsive, completely hydraulic control to meet the need of automated machines for precision reversal of components with fail-safe protection, and for cyclic pro-

(Continued on page 214)

This is the scrap pile for a run of 400 Class 5 tolerance screws

Four minutes' worth of on-the-spot inspection on a Kodak Contour Projector tells operators how five critical tolerances of their work measure with company standards. Result—a reject rate of ¼ of 1 per cent.

The Chicago Screw Company, Division of Standard Screw Company, produces threads to Class 3, 4, and 5 tolerances—fine or better—for automotive, aircraft, and farm machinery makers.

Screws have tolerances of .005″ lead error to fit a .002″ dimensional tolerance gauge; .002″ pitch diameter tolerance; and 15-minute tolerances on flank pitch.

Kodak Contour Projectors make it easy for operators to run rapid routine quality checks. Highly trained inspectors check operators' quality control reports and spot-check production.

When a tolerance question comes up, the accurate answer again comes from a Kodak Contour Projector. In about four minutes, operators check out a thread completely, including pitch diameter, lead error, pitch, depth, and helix angle to tolerances well within .001″. As a result, *the reject rate in the firm's threading division is down to an average of ¼ of 1 per cent.*

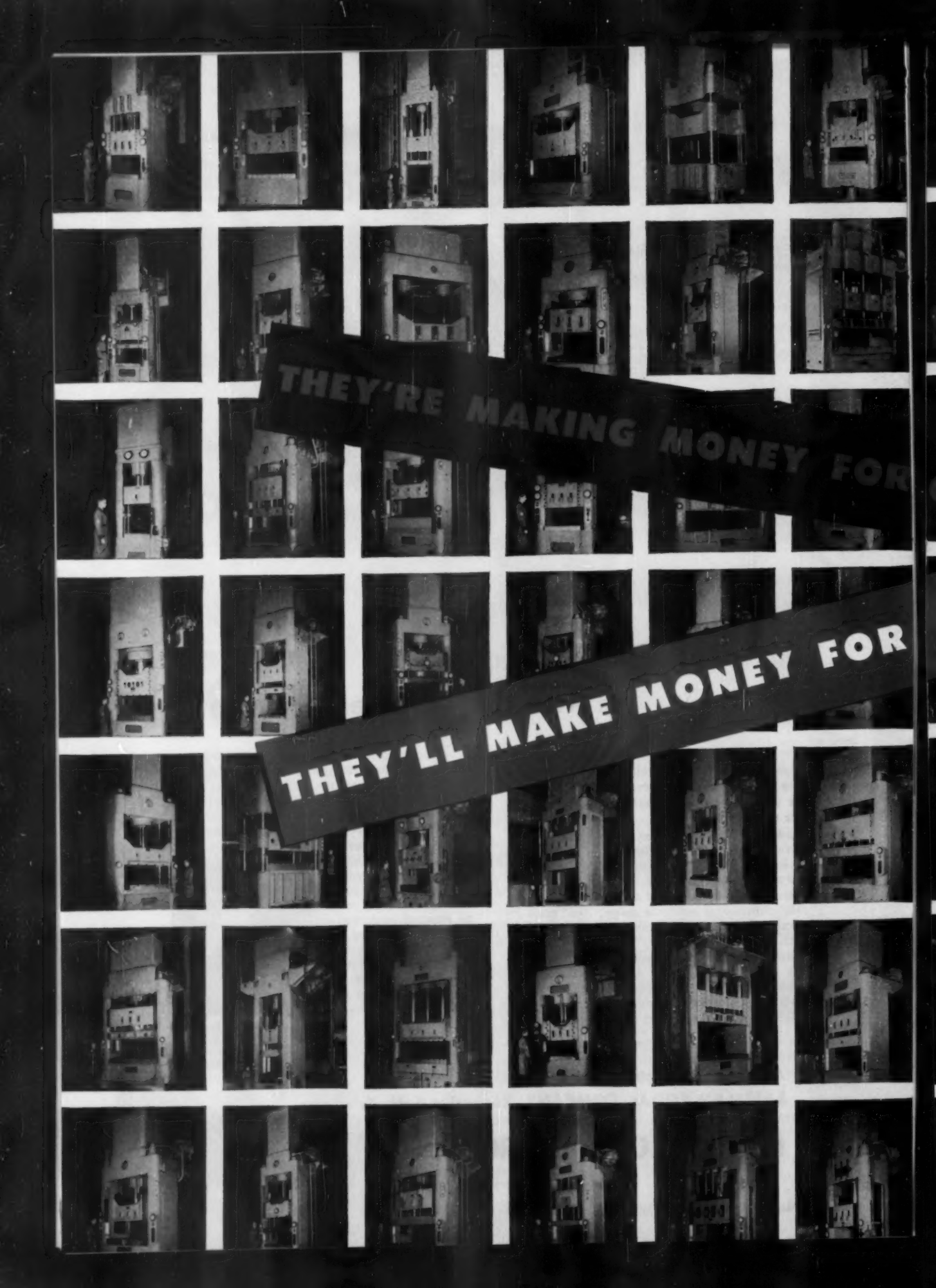
A Kodak Contour Projector can be the way for *you* to keep tolerances profitably tight on mass production runs. It can also be the way for you to improve inspection accuracy and speed—while lowering your inspection costs. Send for the booklet "Projection Gaging with Kodak Contour Projectors." Write to:

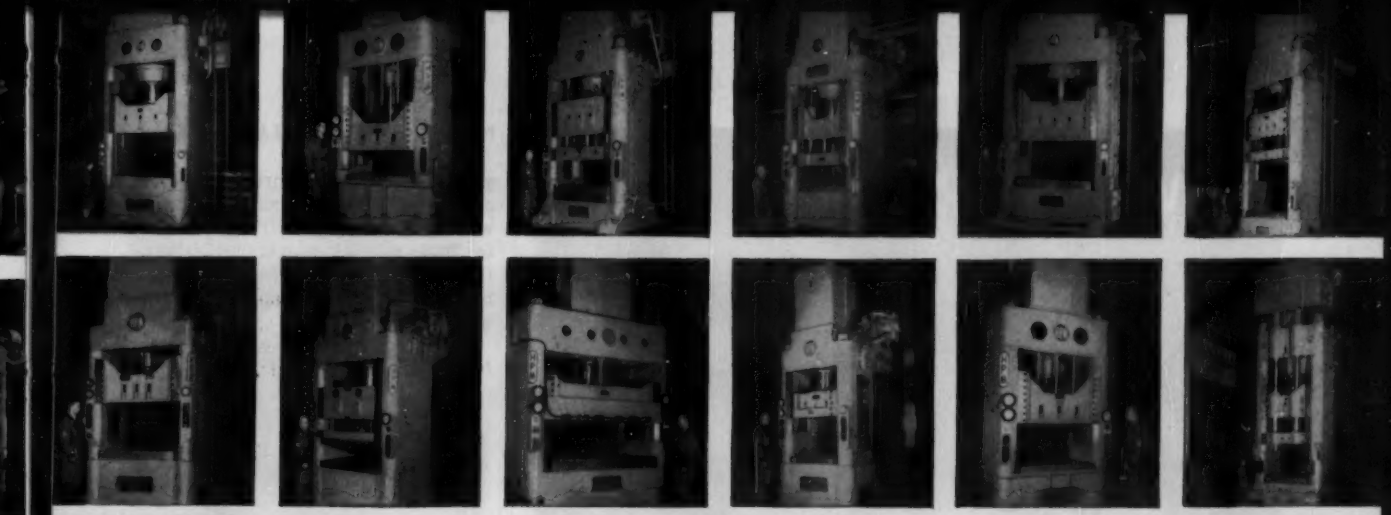
Kodak Contour Projector, Model 14-2A—a versatile, precision measuring projector for toolroom or production line.

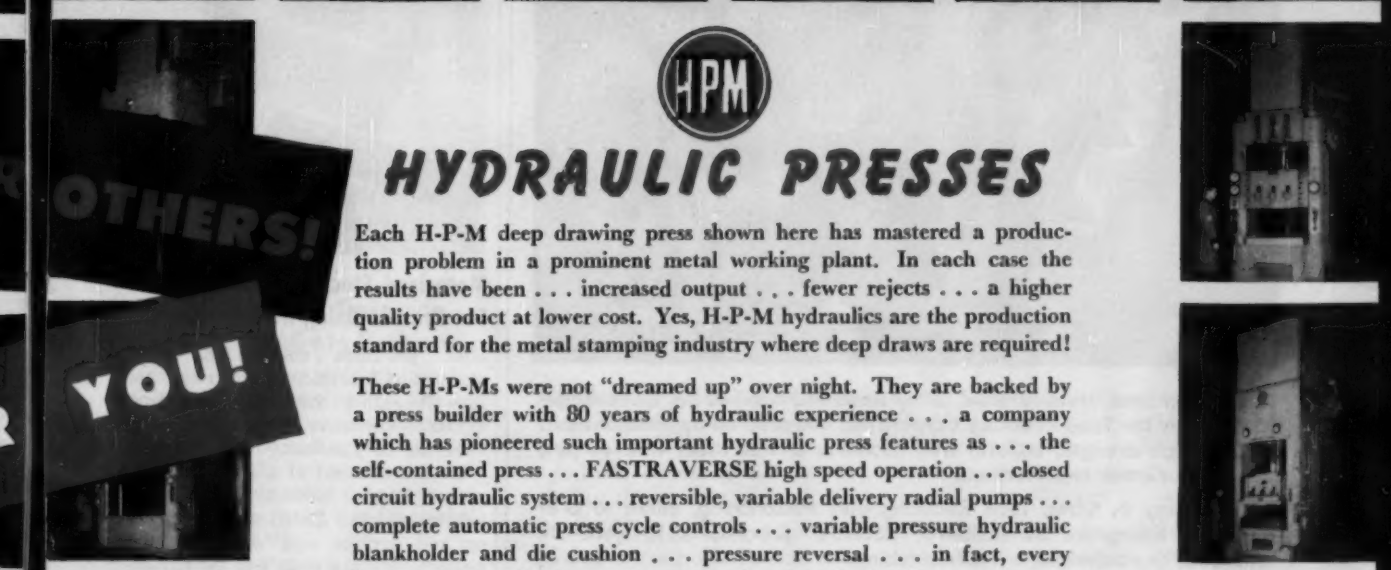
Apparatus and Optical Division
EASTMAN KODAK COMPANY, Rochester 4, N. Y.

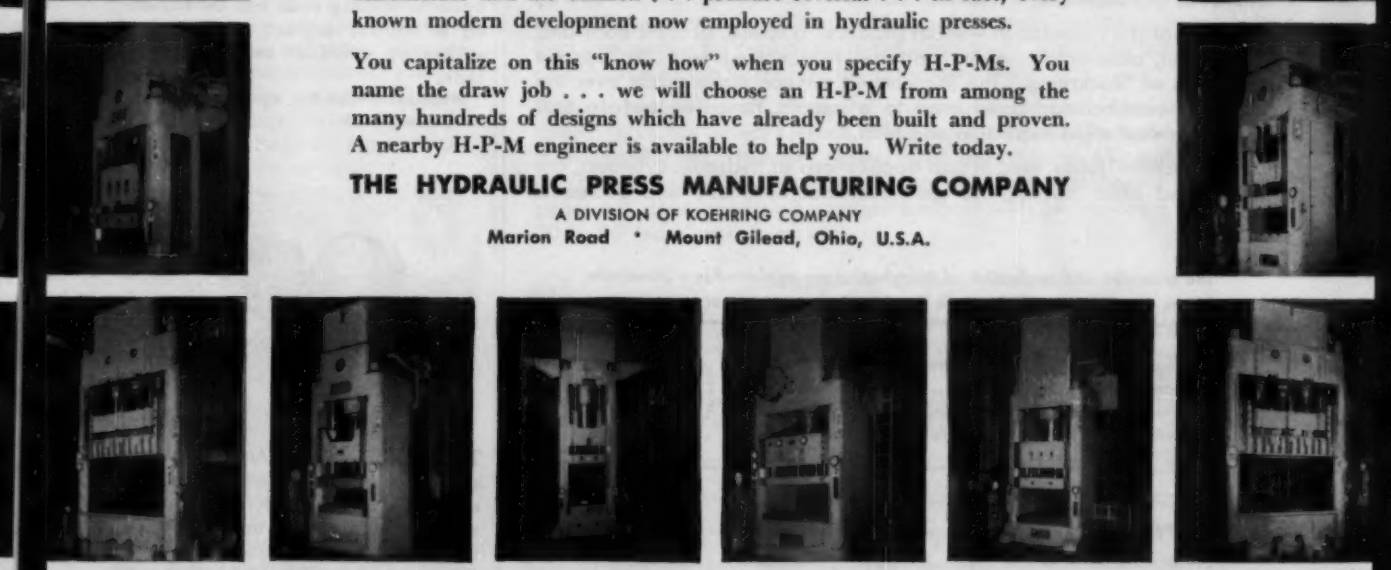
the KODAK CONTOUR PROJECTOR

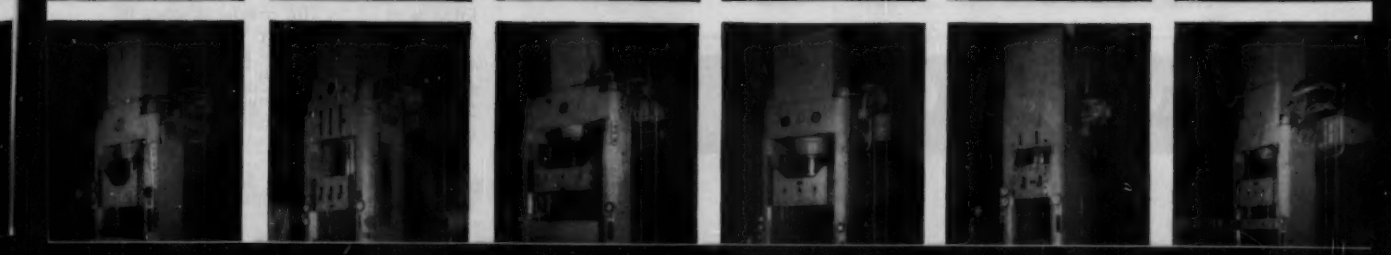
Kodak
TRADE MARK


THEY'RE MAKING MONEY FOR
THEY'LL MAKE MONEY FOR









HPM

HYDRAULIC PRESSES

Each H-P-M deep drawing press shown here has mastered a production problem in a prominent metal working plant. In each case the results have been . . . increased output . . . fewer rejects . . . a higher quality product at lower cost. Yes, H-P-M hydraulics are the production standard for the metal stamping industry where deep draws are required!

These H-P-Ms were not "dreamed up" over night. They are backed by a press builder with 80 years of hydraulic experience . . . a company which has pioneered such important hydraulic press features as . . . the self-contained press . . . FASTRAVERSE high speed operation . . . closed circuit hydraulic system . . . reversible, variable delivery radial pumps . . . complete automatic press cycle controls . . . variable pressure hydraulic blankholder and die cushion . . . pressure reversal . . . in fact, every known modern development now employed in hydraulic presses.

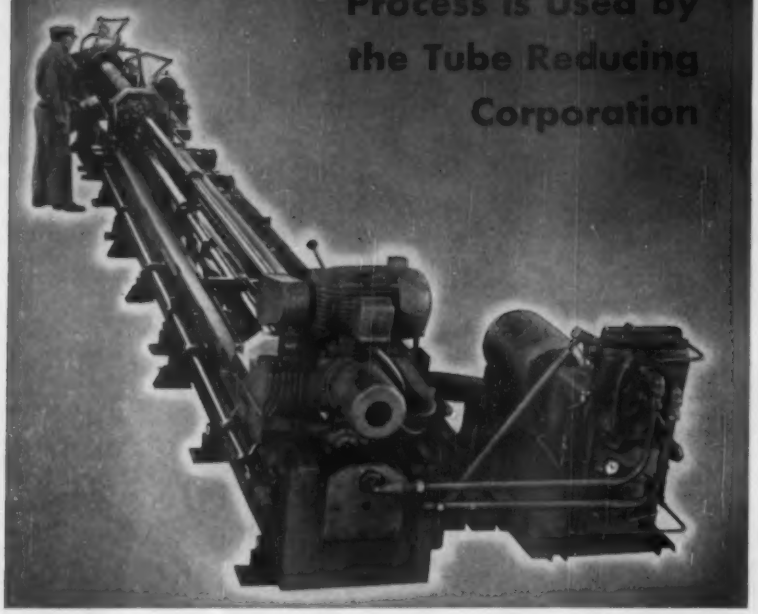
You capitalize on this "know how" when you specify H-P-Ms. You name the draw job . . . we will choose an H-P-M from among the many hundreds of designs which have already been built and proven. A nearby H-P-M engineer is available to help you. Write today.

THE HYDRAULIC PRESS MANUFACTURING COMPANY

A DIVISION OF KOEHRING COMPANY

Marion Road • Mount Gilead, Ohio, U.S.A.

Why MICROHONING Process is Used by the Tube Reducing Corporation



The carbon steel, stainless steel, alloy steel and non-ferrous tubes manufactured by the Tube Reducing Corporation are used on applications that require high strength, uniform wall thickness and surfaces free of pits, scratches or other imperfections.

In processing its tubes, Tube Reducing uses Microhoning, either to prepare the tubing for its exclusive "Rockrite" process, or to generate functional characteristics in finished tubing.

As a preparatory operation—which produces a round, straight bore and a clean-cut, cross-hatch surface pattern—Microhoning helps to improve the results of "Rockriting." The Microhoned surface slides easily over the "rocking" mandrel and compresses to a smooth, flaw-free surface that passes the most rigid inspection and tests.

Other "Rockrite" tubes, used in such applications as hydraulic cylinders, are Microhoned after "rocking" to generate final bore size and geometric accuracy.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____

TITLE_____

COMPANY_____

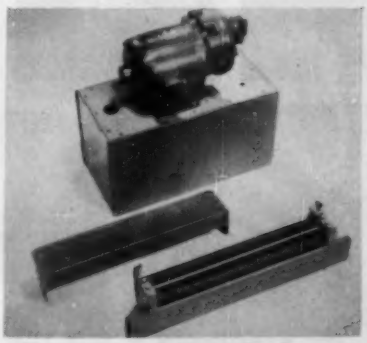
STREET_____

CITY_____ ZONE_____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

grams in continuous processing. Accuracy of reversal remains uniform with pressure differentials from 5 to 2000 psi. Deceleration-acceleration characteristics of reversal can be built in to meet application requirements.

Vanguard Engineering, 51 Washington Ave, Cranston 7, RI

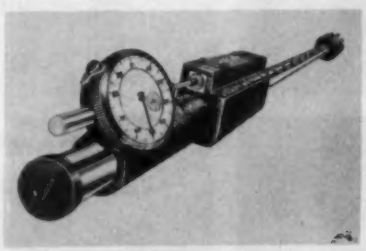


Motorized Stock Lubricator For Presses Using Roll Feeds

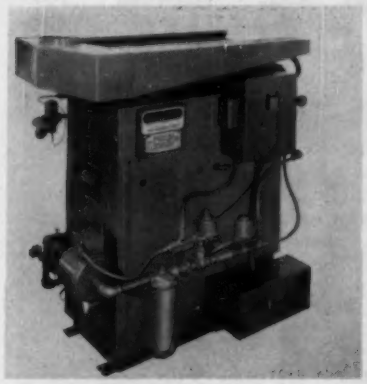
Unit provides continuous, even amount of lubricant to coil stock before it enters the press, guarding against excessive die wear and shearing of punches.

Device consists of a geared pump motor, filter or baffle tank, and stock lubricator head. Lubricant is sprayed on top surface and wiped on the bottom. Wiping rolls can be adjusted to control amount applied; any excess or overflow returns to the tank.

Brandes Press Co, 6408 Euclid Ave, Cleveland, Ohio



TRAVEL CONTROL, Acra-Stop, designed for accurate production control of repeat machine operations, measures accurate cutting to within 0.001 in. Device makes it possible to set up lathe with up to 104 precision stops in 15-in. run. Price, with mounting accessories, is $189.50. Bulletin available—*Joslyn-Hudson Corp, Dept 12, 2040 Colorado Ave, Santa Monica, Calif*



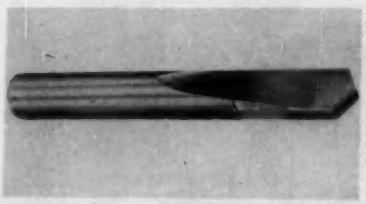
ULTRASONIC CLEANERS, designated Circosonic, are offered in line of seven standard sizes. Machines are welded from heavy-gage steel, zinc metallized; or stainless clad steel. Transducers are frame mounted and positioned for max effectiveness — *Circo Equipment Co, Clark (Rahway), NJ*

Sizing, Gaging, and Inspection Units Can Be Added to Machines

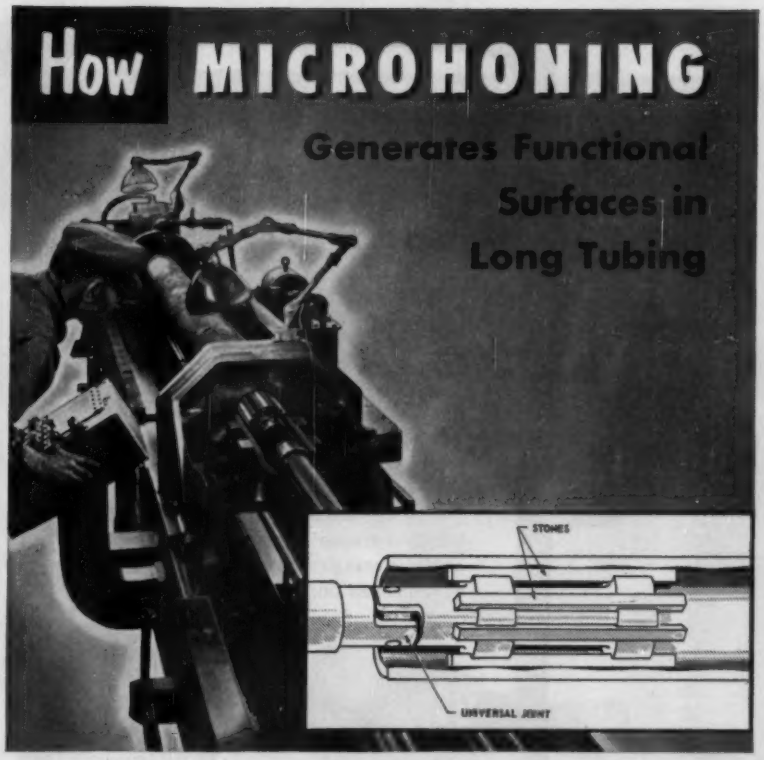
Automatic size control, gaging, inspection, and classifying can now be added to machines by systems made up of combinations of seven standard components. These systems, meant for industrial applications, can be built into new machines or added to existing models.

A typical application to a through-feed centerless grinder includes a meter-type size indicator, comparator-type transducer head for size control, servo motors, electronic classifier for operating reject gates and shutoff, and a magnetic power amplifier for the servo motors.

Cargill Detroit Corp., Birmingham, Mich



DRILL, called Du-Drill, is designed for drilling in hard metals. Tungsten-carbide tip is welded to steel shank, and weld is said to withstand any amount of heat that may be generated. Tool will drill within 0.0005 in. in materials between R_c35 and R_c84. Flat-bottom drill is available for turret lathe and automatics—*Coffey-Cummins Mfg Co, Pasadena, Calif*



Microhoning is used by the Tube Reducing Corporation in processing many types of tubing that range up to 18 feet long and 9½ inches in diameter. The tubes are Microhoned on a horizontal Hydrohoner equipped with a hydraulic clamping fixture that is easily adjusted to handle tubes of various sizes.

Microhoning tools have long abrasive sticks which cannot follow irregularities in the bore. The abrasive action removes high spots while generating required surface characteristics and accurate geometry. A universal joint, connecting the tool body to the drive shaft, eliminates any tendency of abrasive action to change the bore location.

Typical processing of "Rockrite" tubes: To remove scale and deep scratches . . . hot rolled, pierced billets are first bored. Then, the bores are Microhoned—stock removal rate is .015 inch from a 4½-inch diameter x 128-inch length in less than 30 minutes. The Microhoning operation generates accurate, round, straight surfaces with the required finishes of 20 to 30 microinches r. m. s.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

NEVER A DOUBT WHEN THE PILOT LIGHT'S OUT!

Don't guess next time your control line pilot light goes out. Make sure you're using Westinghouse Push-to-Test* indicating lights.

A gentle touch tests the light instantly because an auxiliary set of contacts energizes the bulb. When the light flashes on, you know there is trouble somewhere else in the circuit.

Shock-resistant, U. S. Navy-type lenses with wide-angle visibility assure the best performance. They are available in crystal, red, blue, amber, green and opalescent—frosted to eliminate false indications.

Push-to-Test lights are only one of many outstanding units in the Westinghouse Oil-Tite* pushbutton line. For further information, ask for the new booklet (B-7022) or the *Pushbutton Guide* (B-6749), a 72-page catalog illustrating the complete line. Write to Westinghouse, Box 868, Pittsburgh 30, Pa., or call your local Westinghouse distributor. *Trademark

J-30255

YOU CAN BE SURE...IF IT'S Westinghouse

NEW SHOP EQUIPMENT

Cutting fluids, Jet-Cut 9 and Flo-Cut 15, are recommended for tapping, drilling, milling, hobbing, and threading operations on tough, ductile materials such as stainless, boron, titanium steels, and other hard-to-machine alloy steels. Jet-Cut 9 can be applied by brush or squirt oiler; Flo-Cut 15 is formulated for use in circulating, drip, wick, and vapor or mist systems. Both are odorless and non-toxic.

Beloit Tool Corp, Regal Div, P O Box 30, Beloit, Wis

Surface active agents, J Series, have been added to company's Poly-Tergent line. These agents are effective over a temperature range from –32 to +212 F. J-200 can be used to remove oil or grease; J-300 serves as wetting agent in metal pickling; J-400 is used in pickling steel; J-500, as well as the other three agents, are used as metal cleaning compounds.

Olin Mathieson Chemical Corp, Industrial Chemical Div, Baltimore 3, Md

High-speed end mills incorporating new flute shapes and new types of relief have been added to W&B line. Series includes single and double end styles; two, four, or multiple flutes; straight and taper shanks; square and ball nose styles; small or large diameter; stub, regular, or extra length; heavy-duty types; shell end mills; arbors and end mill holders.

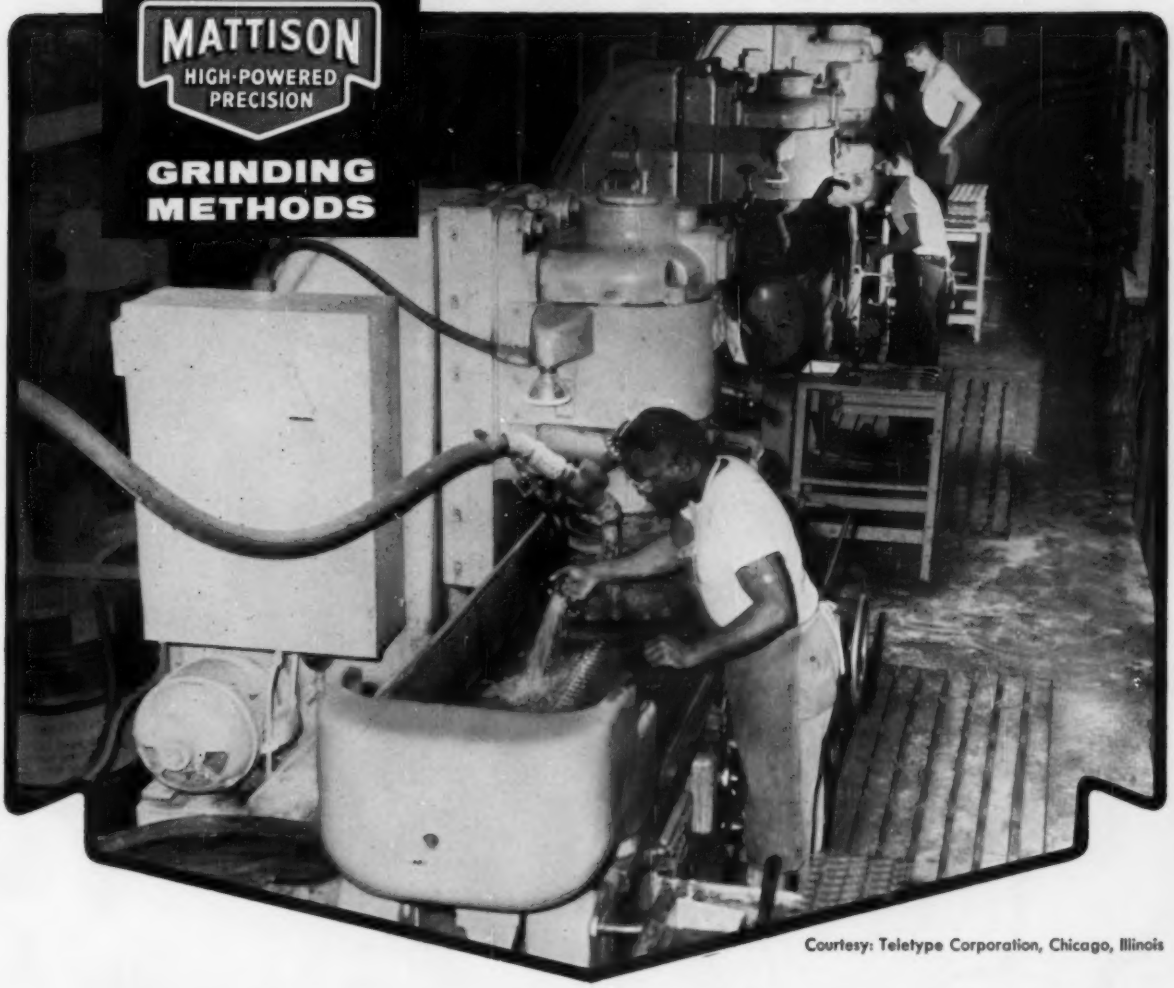
Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich

"I don't think you're doing your best, Buxton. You've been boss of your department six years and you don't have an ulcer!"

CASE HISTORY NO. 39—SMALL STEEL PARTS

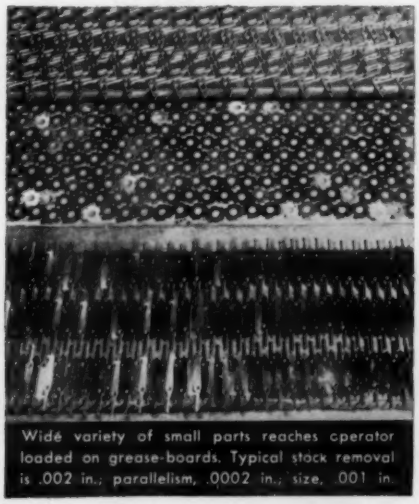
MATTISON
HIGH-POWERED PRECISION

GRINDING METHODS



Courtesy: Teletype Corporation, Chicago, Illinois

Grease-board loading, high-powered surface grinders speed production of precision small parts

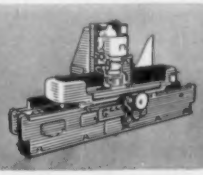


Wide variety of small parts reaches operator loaded on grease-boards. Typical stock removal is .002 in., parallelism, .0002 in., size, .001 in.

Vital stamped steel parts are finish-ground to close tolerances at rates up to 700 per hour, by the Teletype Corp., Chicago, Ill. Use of grease-board loading and high-powered Mattison Vertical Spindle Surface Grinders makes this performance possible.

Over 2,000 varieties of parts are ground on three heavy Mattison machines. Most are moving components of sensitive communication and tabulating machines. Boards with 100 or more pieces held with axle grease are delivered to each operator. He reverses the board on the magnetic chuck to quickly load the grinder . . . greatly reducing setup time. Parts are loaded on the boards right from the punch presses. Two of the Mattison grinders used in this plant have been in service for ten years and the third for six . . . without a shutdown for major maintenance. They are presently used 16 to 18 hours a day, 6 days a week, holding tolerances on production runs to .0002 in. The heavy base and column construction, longer V and flat ways for both head and table, and over-all rigidity of Mattison Vertical Spindle Surface Grinders make this heavy-duty repetitive grinding possible. See your Mattison dealer for full details.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS

THE Life Line IS MOVING

UP... TO 125 H.P.

now, industry-proven motor design available in large sizes, giving more motor for modern production systems

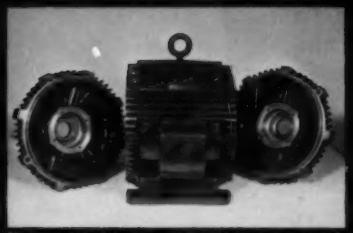
Westinghouse anticipates modern motor requirements in the new line of large-size Life-Line® "A" Motors—with design and construction features for longer motor life, lower maintenance, and better system operation. You get more for your motor dollar. New models will be available in both drip-proof and totally-enclosed styles with frame sizes through 445.

POWER-UP for tomorrow's production needs with the new large-size Life-Line "A" a-c motors. For complete information . . . call your Westinghouse sales engineer or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE... IF IT'S

Westinghouse

Tested and proven Bondite®, Bondar® and Mylar® insulating materials are used throughout the larger motors, guaranteeing the performance needed for heavy-duty service. ® Reg. U.S. Pat. Off. Trade-Mark

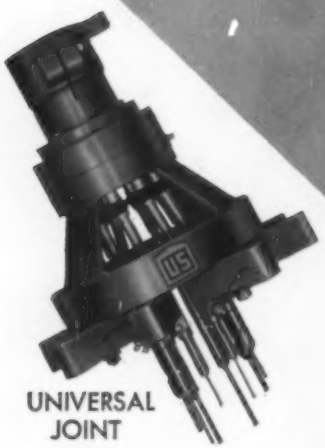


For outstanding motor protection a rugged new housing has been designed, featuring internal bracket ribbing for greater protection against physical abuse.

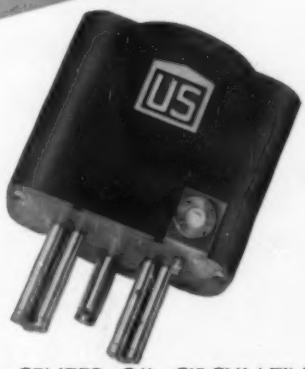
For flexible specification to match operating conditions, three types of bearings are offered: sealed-for-life, twin-shielded greasable and sealed sleeve.

®TRADE-MARK J-22940

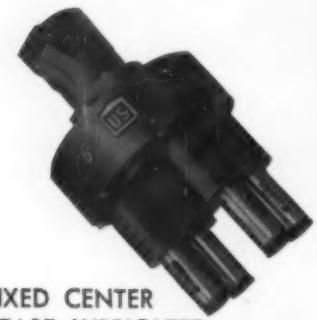
For men who know Drill Heads Best...
it's always
U. S. DRILL HEAD
5 to 1



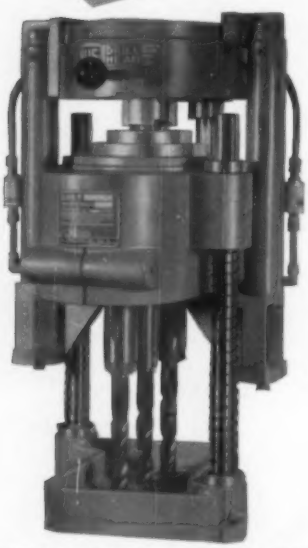
UNIVERSAL JOINT



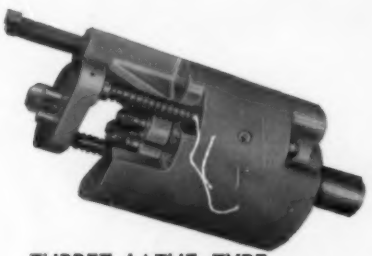
FIXED CENTER OIL CIRCULATING



FIXED CENTER GREASE LUBRICATED



RADIAL SWIVEL ATTACHMENT WITH AIR COUNTERBALANCE



TURRET LATHE TYPE

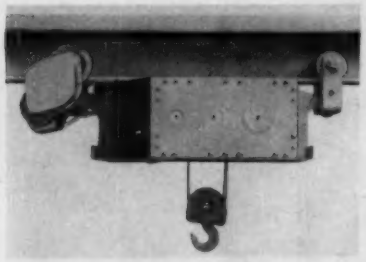
INDIVIDUAL LEAD SCREW TAPPER

STANDARD ADJUSTABLE

US DRILL HEAD

UNITED STATES DRILL HEAD CO.

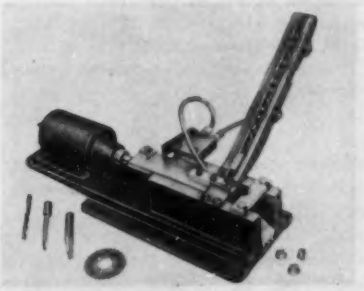
BURNS STREET • CINCINNATI 4, OHIO



Heavy-Duty Hoists Require Less Headroom, Have Precision Control

Requiring 37% less headroom and having precision load control to within 0.008 in., new line of heavy-duty hoists is designed for loads from 3 to 15 tons. Motor and drum are parallel-mounted on same side of gear box, permitting load block to retract between them. Load control is achieved through instant torque of the motor and use of two braking systems. Regenerative braking automatically regulates load travel to controllable speeds. Powerful oversize electro-mechanical brakes are used to stop capacity loads instantly. Either brake system will handle a load up to 150% of rated capacity.

R G LeTourneau, Inc, 2399 S MacArthur, Longview, Texas

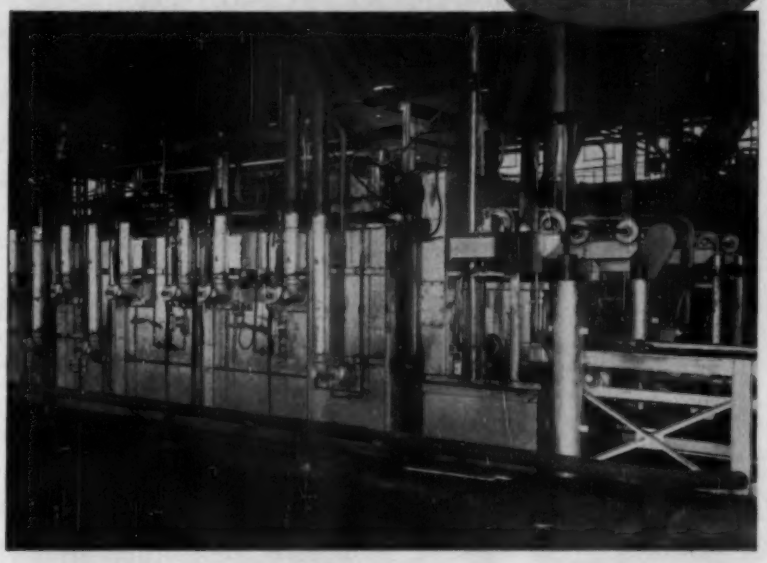


WORK FEEDER, Model 43, features a new air cylinder designed to accept a larger-diameter return spring. Other redesigned features include increased oilite bearing surface, more uniform dimensions for slide and dovetailed ways, and machine-ground mounting surfaces—*Mead Specialties Co, Dept WF-4, 4114 N Knox Ave, Chicago 41, Ill.*

Safety hat, designated Superlite, is made of aluminum alloy, is ribbed for max resistance to blows, and is completely adjustable for sizes 6⅝ to 8.

Boyer-Campbell Co, Safety Div, 6540 St Antoine, Detroit 2, Mich

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT



LET'S TALK ABOUT

PRODUCTION DEMANDS

High production demands can be met only when every piece of equipment in the plant is geared to its job. In many plants, the bottleneck is heat treating because furnaces which were modern five years ago are virtually obsolete. These units must be replaced, redesigned, or added to.

Automatic handling of materials is one answer, of course. Today, some heat treating systems are tied right into production lines. In other plants, work is centralized with automated equipment eliminating most stock handling. A single operator loads green work and removes finished parts.

Some furnaces accomplish dual jobs. A recent Holcroft installation was built to temper two entirely different classes of carburized parts. The furnace was designed with a double chamber with each side operating at the required temperature. Flags, placed on the trays requiring low temperature tempering, keyed the line so that the work automatically positioned itself in front of the correct chamber. Another installation featured a double deck furnace—designed so that two entirely different heat treat processes were accomplished in space where but a single furnace would normally go.

And so it goes: a little idea to save a minute or to eliminate a manual operation—a brainstorm that combines two or more furnaces or steps up furnace capacity. This Holcroft concept can help you produce more for less and with better quality. Better write today.

8030

HOLCROFT AND COMPANY

6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • HARTFORD, CONN. • HOUSTON, TEXAS • PHILA., PA.

CANADA: Walker Metal Products, Ltd., Windsor, Ontario

I-R TORSION BAR TORQUE CONTROL

TORQUE CONTROL IMPACTOOLS

consistently run nuts to prescribed torques

I-R Torsion-Bar Impactools now assure top quality control on these 3 operations:

1. *Assembling differential main bearing caps at 450 ft. lbs. both before and after machining as shown above.*
2. *Preloading differential drive pinion bearing with Impactools set at 375 ft. lbs.*
3. *Assembling wheels to wheel hubs at 425 ft. lbs.*

Quality control has risen to a new high for this large manufacturer of farm equipment since I-R Torsion-Bar Torque Control Impactools were installed.

These Impactools are the *only* power wrenches that deliver full power and speed until the preset torque is reached, and then instantly and automatically shut off.

Now, with Torque Control Impactools, the company consistently runs nuts to prescribed torques, saves time, improves quality and eliminates hand torque checking operations.

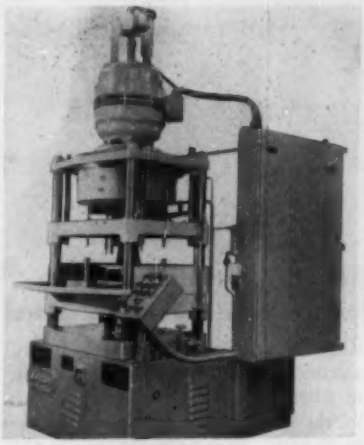
Write for Bulletin 5170 for proof of how these amazing Impactools can improve quality and cut costs on your own applications.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

8-524

NEW SHOP EQUIPMENT



TAPPING AND DRILLING MACHINE combines tapping with drilling and reaming in 4-post machine designed originally for latter operations only. Drill head and fixtures are removed to take a lead screw tapping head. Holes as close as the sum of the hole diameters can be drilled and tapped. Machine is standardized in 32-in. size—*Zagar, Inc, 23886 Lakeland Blvd, Cleveland 23, Ohio*

Liquid spring, Model 1099, is built into a bolt, has a low spring rate of 500-lb preload, 1000-lb end load, and a stroke of 2½ in. Over-all dimensions are 1¼-in. OD, 12¾ in. long, with an external 1½-6 thread.

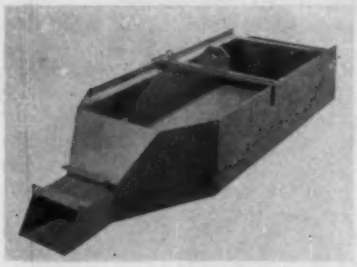
Taylor Devices Inc, North Tonawanda, NY

Square steel bar and forging stock, rolled and cold finished, is now available in sizes 2¼, 2½, 2⅝, 2¾, and 3 in. square. New sizes will be available in a wide range of alloys including 1100, 3003, 3052, 2014, 2017, 2024, 6061 and 7075.

Kaiser Aluminum & Chemical Sales, Inc, 919 N Michigan Ave, Chicago 11, Ill

Brazing material called Braze-Clad N is supplied as pure nickel strip with predetermined thickness of silver brazing alloy on one or both sides. Material is recommended for high temperature applications, such as stainless steel honeycombs, electronic tubes, jet aircraft, and nuclear structures. Fabrication and method of application is same as for previous Braze-Clad material (*AM*—May 7 '56, p237).

American Silver Co, 36-07 Prince St, Flushing 54, NY



Steel Hoist Pans Expedite Loading of Chips and Other Media

Hoist pans, designed to speed loading of chips and other media, come in four sizes ranging in capacity from 4 to 14 cu ft. Pans are welded from 10-gage steel and are fitted with either rollers or roller-bearing wheels. Pan is placed under gate of storage bin; gate is lifted, admitting chips.

Model 4 (capacity 4 cu ft; size, 43 x 24 x 13 in. high) holds up to 500 lb of fused aluminum oxide chips. Model 6.5 (6.5 cu ft; 65 x 19 x 15 in.) holds 800 lb. Model 11 (11 cu ft; 81 x 27 x 14 in.) holds 1400 lb. Model 14 (14 cu ft; 81 x 33 x 14 in.) holds up to 1800 lb.

Lord Chemical Corp, York, Penna

Tumbling Barrels Speed Output Of Small, Precision Parts

Barrels, designated White-Lined Mini-Tumbler barrels, are lined with seamless vinyl plastic, are non-contaminating, and resistant to chemicals and abrasion. For bench use, barrels are available in either open conical or closed barrel types, both suitable for steel ball burnishing of small parts. Closed barrel (illustrated) measures 9 in. in dia by 3¾ in. deep.

Ramps Mfg Co, 1491S Woodworth Ave, Cleveland 10, Ohio

small, lightweight air hoist gives you greater VERSATILITY

Ingersoll-Rand

AIR-BLOC combines safety, ruggedness and mobility...

Move it anywhere . . . hang it anywhere . . . the I-R AIR-BLOC gives you versatility you never thought possible for speedy handling of loads up to 1000 pounds. No mechanical brake to fail . . . load can't drop even if air pressure fails. Responsive throttle control and automatic up-down-stop permit extremely accurate handling. There's a size just right for your job.

Portable winch-type Utility Hoists, in a wide range of sizes up to 4000 lbs., are also available from Ingersoll-Rand.

PENDENT THROTTLE

The only complete line of air hoists with convenient "one-hand" control.

- Speeds spotting of loads.
- Provides "Finger-tip" control over full range of speeds.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

AIR HOISTS up to 24,000 lbs.

8-529

Add flexibility to your machines with low-cost speed control

Choose from 8 sizes . . . ¼ to 15 hp . . . 1.75:1 to 4:1 speed ratio. Converts any standard constant-speed motor into variable speed drive.
MAXIMUM TO MINIMUM OUTPUT SPEED POSITIONS

REEVES®

Vari-Speed Motor Pulley

Get greater productivity . . . run at the most economical production speed . . . handle production or process variables with the same machine—install low-cost REEVES Vari-Speed Motor Pulleys!

Change machine output speeds . . . instantly and accurately . . . without interrupting production. Positive "close-grooving" lubrication assures free sliding discs for *easy, sure* speed adjustment. Minimum parts mean long, trouble-free service.

Write today—A29d-V545; we'll send your copy of the Motor Pulley bulletin complete with rating data and dimensions.

REEVES PULLEY COMPANY

Division of **RELIANCE** ELECTRIC AND ENGINEERING CO.

Columbus, Indiana

NEW SHOP EQUIPMENT

Repair material called Steelpatch, a mixture of micronized steel and epoxy resin, can be used for fastening conduit, piping, shelving-brackets, insulating and other materials to concrete without special tools or drilling. Product can also be used to "glue" steel and other broken machinery parts together, to fill castings, or to repair cracked engine blocks. Available in 5-oz tubes at $1.50.

Lockrey Co, Plastics Div, Southampton, NY

V-belt clutch, new model Rev-O-Loc type AV for electric motors and gasoline engines, pulls up to 3 hp at 3600 rpm. Unit automatically adjusts for wide variations in belt tension, permits latitude in pulley centering. Weight is 13 oz, pulley dia is 2¾ in.; available with ½, ⅝, or ¾-in. bore.

Rev-O-Loc Clutch Corp, PO Box 1806, Milwaukee, Wis

Forged safety tools made of aluminum-bronze alloys have been added to company's line of safety tools. Line of forged, non-magnetic, noncorrosive, and spark-resistant tools includes adjustable and box wrenches, pliers, pneumatic tools, air-hammer chisels, and air-hammer points.

Ampco Metal, Inc, 1745 S 38th St, Milwaukee 46, Wis

High-speed end mills are available in complete range of styles and sizes. Sharp corners have been eliminated for greater strength; flutes are designed so that chips move out freely.

Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

I just had an ideal Why don't we switch places awhile?

Speed Inspection
OF PRODUCTION PARTS!

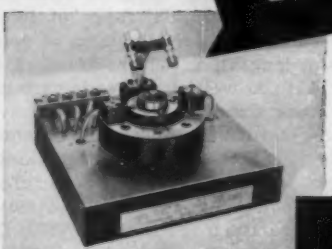
NEW **DEARBORNAIRE**

MULTIPLE COLUMN
AIR GAGING INSTRUMENTS

To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced . . .

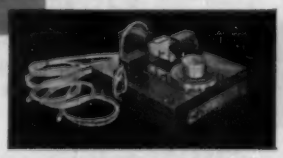
- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
- New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
- Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
- Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.

Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!



Special Air Gaging Fixtures designed and built to meet your particular application requirements. Complete engineering service available upon request.

Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.



AIR GAGE DIVISION
DEARBORN GAGE COMPANY
22038 Beech Street • Dearborn, Michigan

ENGELBERG Two-Side Grinder Cuts Printed Circuit Finishing Time by 93% For IBM SAGE Computers!

MODEL 1092 2-SIDE GRINDER

THE ORIGINAL OPERATION

An Engelberg conveyor-type abrasive belt grinder has multiplied production *by sixteen* — and virtually eliminated rejects — on a finishing operation at the Kingston, N. Y. plant (Military Products Division) of International Business Machines Corp.

Here the I.B.M. SAGE Computer is produced for the U.S. Air Force. To produce printed circuits for this computer, perforated phenolic sheets are copper clad on both sides, then coated with graphite. Excess graphite remaining on the two surfaces must then be removed.

Previously, the sheets were sanded under water by a pneumatic, oscillating hand sander. Sixteen man-hours were required to meet daily production.

Using a 240-grit belt, the Engelberg Model 1092 (described at right) removes .0001" on one pass . . . flips the sheet . . . removes .0001" from the other surface . . . all in a single cycle. The graphite coating remains only to coat the walls of the holes pierced in the part.

SOLUTION TO IBM'S PROBLEM: THE MODEL 1092 TWO-SIDE GRINDER

This high-production, semi-automatic abrasive belt machine gives precision finishing to close tolerances on both flat surfaces of *any* ferrous, nonferrous, plastic or other materials. Piece-work first passes under grinding head at left, then is carried around to bottom conveyor belt with unground face *up*, positioned for passage under second grinding head at right.

For complete information on this and other Engelberg Abrasive Belt Grinders consult your Sweet's Catalog or write . . .

The ENGLEBERG-HULLER Co., Inc.
186 Seneca St., Syracuse, N. Y.

ENGELBERG PRECISION ABRASIVE-BELT GRINDERS

Side-Loading Chip Cart Has Lowered Bin-Type Side

CeCor Model 43 and 44 chip carts have permanently mounted side handles which permit three-position rollover dumping of loads weighing up to 500 lb. Carts are mounted on four 5-in. swivel casters and have removable handles which fit at either end of cart. Model 43 has capacity of 6.9 cu ft, Model 44 holds 8.7 cu ft. Mesh drain racks and drain-out plugs may be specified. Standard construction is 12-gage steel; stainless is available.

Coolant Equipment Corp, Verona, Wis

Flat Ground Die Steel Available In 1300 Standard Stock Sizes

Features of Heller Nucut die steel include surface finish of 25-35 mu-in., easy machinability, wide hardening ranges.

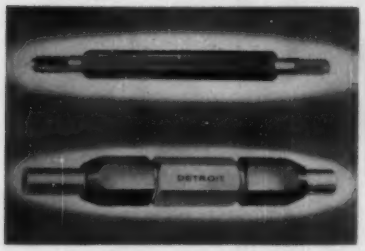
Oil hardening type, a high grade molybdenum alloy tool steel, may be used for a wide variety of toolmaking jobs. R_c of 64-65 may be achieved by hardening in the range of 1450 to 1540 F. It is available in 18 and 36-in. lengths, in widths from 1/64 to 14 in., as well as in a wide variety of stock sizes.

Air hardening type, a 5% chrome alloy, is recommended for making tools used for long production runs. R_c of 63-65 is achieved within temperature range of 1700 to 1800 F. This type is furnished in 36-in. lengths in a wide range of widths and thicknesses, including squares. Catalog and data book available.

Heller Tool Co, Newcomerstown, Mich

Die head, incorporating features of new DSA die head (*AM*—Mar 25 '57, p194), was designed specifically for No. 4 Brown & Sharpe automatic, and will take the full capacity of the machine.

Greenfield Tap and Die Corp, Geometric Tool Co Div, New Haven 15, Conn



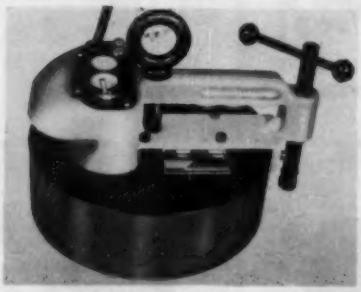
CARBIDE PLUG AND THREAD GAGES have been added to company's line of gages. Plug gages are available in two types: reversible (wire type) from 0.020 to 0.760-in. dia, and AGD taperlock type from 0.105 to 1.510-in. dia. Both are available in XX, X, and Z tolerances. Thread gages come in taperlock and trilock types from No. 4 through 3-in. sizes, and in reversible types from No. 4 through ¾-in. sizes—*Detroit Tap & Tool Co, 8615 E Eight Mile Rd, Baseline, Mich*

Reeve Electronics Introduces Two 3-kw Induction Heaters

Model L4E, designed for ferrous metals, and Model L6E, for non-ferrous metals, are floor-mounted units designed for induction heating in operations such as brazing, soldering, hardening and annealing. They feature built-in output transformer, continuously variable power output control from 3 kw down to ½ kw, automatic recycling heat-cycle timer, and circuit breakers.

The 3-kw heaters measure 50 in. high, 32 in. wide, and 28 in. deep, weigh approx 450 lb, and have interlock switches on all access doors.

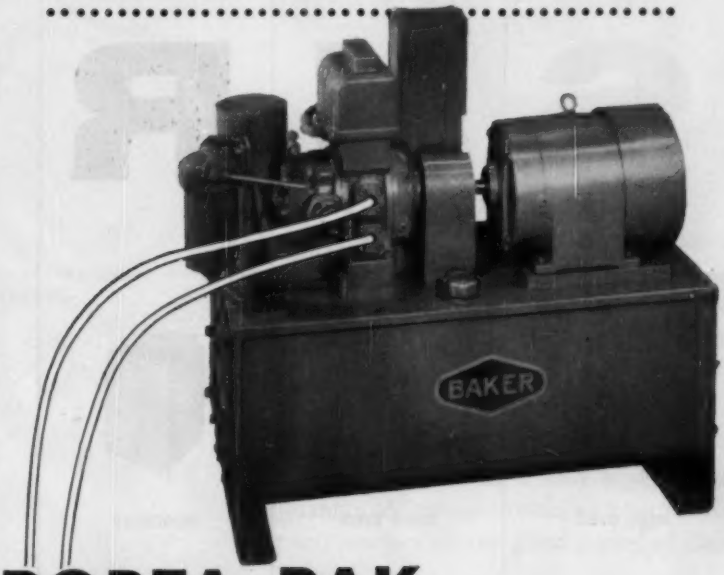
Reeve Electronics, Inc, 609 W Lake St, Chicago 6, Ill



MAGNETIC PLATE CLAMP, Mag-Tool Model PH, is designed for holding heavy metal plates in alignment for welding. Clamp exerts force up to 8500 lb, weighs 85 lb, and draws 65 watts—*Magnetic Tool Corp, 1955 Lafayette St, Santa Clara, Calif*

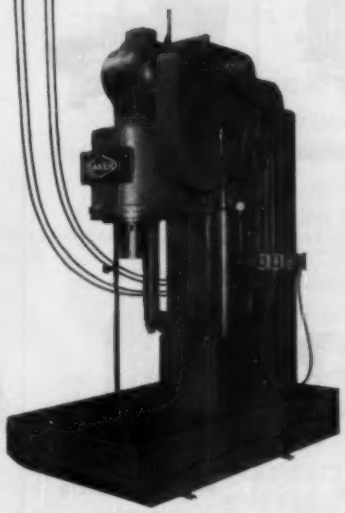
(Continued on page 226)

another BAKER bonus



PORTA-PAK

. . . SERVICE IS A SNAP



Here's a *separate* hydraulic power source that's attached to the machine only through the hydraulic lines. So it can be placed in any convenient location . . . and it's always easily accessible for service. A completely self-contained unit. Porta-Pak can be furnished on all Baker specials — or on Baker Basics, for automation with *standard* machines.

BAKER

AUTOMATION

Best in the long run
Practical in the short run

CHECK AND MAIL FOR DATA

( ) Porta-Pak hydraulic power source
( ) Exclusive twin-pull hydraulic feed cylinders — compact, easily accessible.
( ) Hardened, ground steel or cast iron ways — durable
( ) Big ball bearings throughout, rugged construction

BAKER BROTHERS, INC.
Dept. AM-657, Toledo 10, Ohio

Yes, tell me more about these Baker Bonuses.

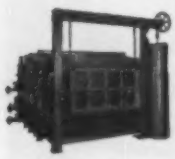
NAME AND TITLE

COMPANY

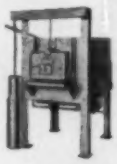
ADDRESS

CITY ZONE STATE

SURFA



large oven



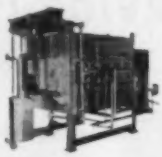
small oven

laboratory

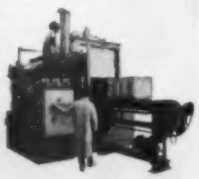
circular pot

rectangular pot

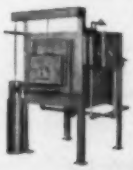
forge



balco® atmosphere



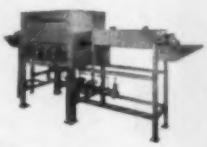
allcase® atmosphere



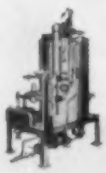
horizontal muffle

vertical muffle

brazing



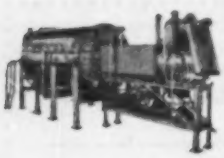
sintering



MRX® atmosphere generator

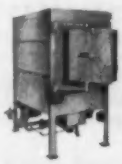
MDX® atmosphere generator

MAX® atmosphere generator



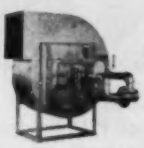
stainless steel

rivet heater



horizontal convection

vertical convection



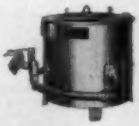
direct air heaters

C E

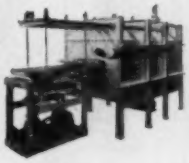
tilting metal melting

stationary metal melting

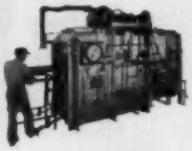
soft metal melting



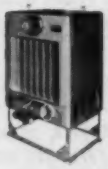
aluminum melting-holding



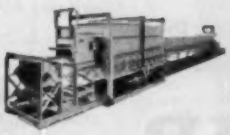
continuous snap hearth



continuous link belt



indirect air heaters



continuous brazing

widest selection

The Surface line of Standard Rated equipment offers a broad range of types and sizes to choose from. Exactly what is needed can be selected. Standard furnaces can be modified to meet the demands of unusual applications.

known production rates

Rated production makes it easy to determine the quantity of finished product which a Surface unit will produce in any given period of time.

known operating costs

Tabulated figures and performance curves on all units clearly indicate in advance the operating cost per pound of finished product.

quick delivery

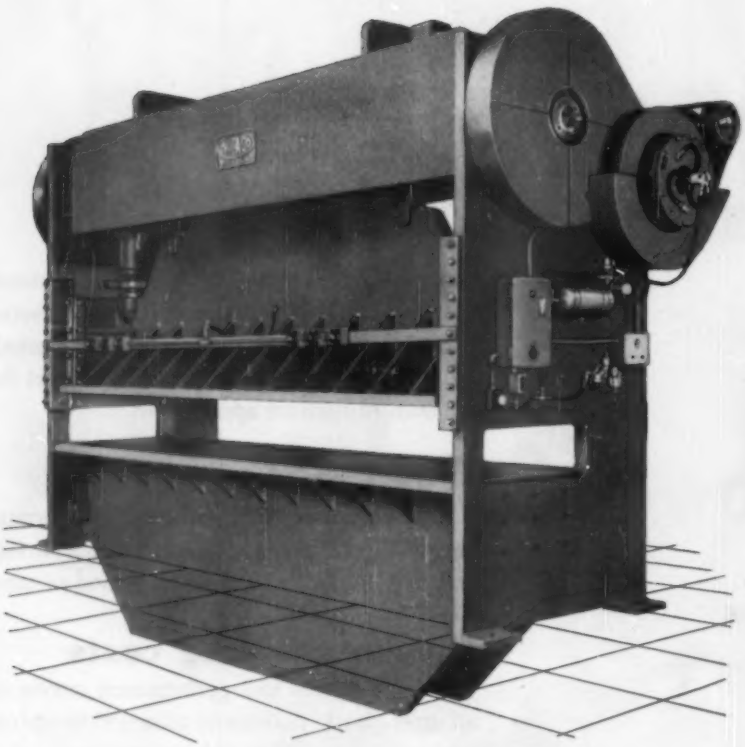
Surface standardization permits stocking the same parts for many different furnaces. This cuts engineering and procurement time. Surface also offers 80 types and 800 sizes of industrial burners—the same as used on Standard Rated furnaces—for application to your existing furnaces or other requirements.

Write for Bulletin SC-175.

HEAT TREAT, STEEL MILL, GLASS DIVISIONS
SURFACE COMBUSTION CORPORATION
2365 DORR STREET TOLEDO 1, OHIO

Surface®

wherever heat is used in industry



CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

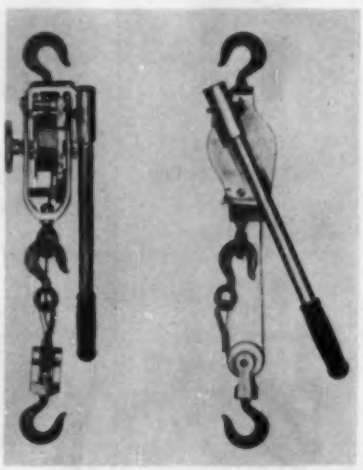
6674

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP
MANUFACTURING CO.
7434 South Loomis Boulevard, Chicago 36, Illinois

HAND LIFT TRUCK, Red Arrow, has an exclusive engagement and disengagement handle which is said to eliminate the problem of the "flying handle" in hand lift trucks. No special push rods, levers, or extra foot pedals are needed. Entire lifting mechanism and safety device is controlled in the lifting arm; one foot pedal lowers the load. Bulletin RA—*Lift Trucks, Inc, Cincinnati 14, Ohio*



PORTABLE WINCH HOIST has 2-ton capacity, weighs 13½ lb, and has a safety overload factor of approx 100%. Unit is made of aluminum alloy castings, with stainless steel shafts and springs, and comes equipped with 25 ft of wire rope. Price: approx $51 — *Aluminum Products, Inc, Fort Lauderdale, Fla*

Remote control device attaches to side of mast on a fork-lift truck and permits operator to control lifting when he is off truck. Device is said to be especially useful for die handling.

Lamson Mobilift Corp, Portland, Ore

NEW SHOP EQUIPMENT

Vibrating conveyor features low headroom—standing only 4½ in. high—and is designed for scrap removal under metalworking machines, such as lathes, punchpresses, and milling machines. Unit can be arranged with drains for easy coolant collection and removal.

Carrier Conveyor Corp, 190 N Jackson St, Louisville 2, Ky

Carbide face mills, designed for cutting aluminum, brass, and steel, have integral ¾-in. straight shank, and are offered in 14 standard models with 1½, 2, and 2½-in. dia cutters, and over-all length of 2⅞ in. Stubby design is said to eliminate need for special adapters or holders and brings cutter as much as 3 in. closer to spindle bearings. Prices range from $17.80 to $25.40. Bulletin FM-27.

Bollier-Damerell, Inc, Niagara Cutter Div, 330 Niagara St, North Tonawanda, NY

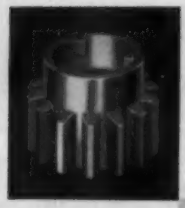
Wash concentrate for cleaning metal, plastic, and aircraft bodies can be added to water at rate of 1 gal to 100 gal of water. Said to be fast drying and drop-free, non-flammable product readies articles for high-luster painting.

Merix Chemical Co, 1021 E 55th St, Chicago 15, Ill

Marking stylus, Perma-Scribe, can be used for permanent marking on metals of all degrees of hardness, all plastics, wood, or glass. Price of pen-shape unit is $1.00.

Arch Crown Tags, Inc, 277 Halsey St, Newark 2, NJ

"I have a pain between my calipers and my micrometer."



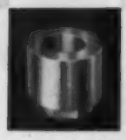
GIVING YOU

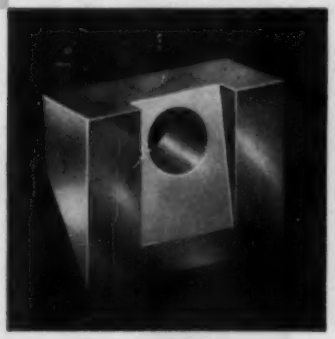
...the best and most modern!

Bunting today covers a new area in the engineering and manufacture of bearings and machine parts. To the traditional line of Bunting Cast Bronze Bearings and parts is added up-to-date, soundly established facilities for engineering and manufacturing bearings and parts made of Sintered Powdered Metals.

In an entirely new plant with the very latest equipment, Bunting now attains the position in the Sintered Powdered Metals field which it has long held in the field of Cast Bronze Bearings.

A competent group of Bunting Sales Engineers in the field and a fully staffed Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.





Write for catalogs and your copy of the new 24 page Bunting Engineering handbook of Sintered Powdered products and their composition, manufacture and application.

Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

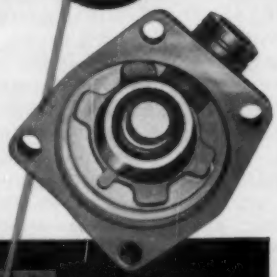
720 Assemblies Per Hour AUTOMATICALLY!

This Robbins "Assemblimatic" feeds, positions, assembles and unloads automatically . . . producing 720 four-piece assemblies every hour! It assembles a needle bearing, washer and seal in two sizes of a steering gear end cover. Parts are fed and positioned from indexing magazines, and completed assemblies are removed and placed on a conveyor . . . all automatically.

Machine features include: (1) Robbins panel, one-third standard size, with plug-in aircraft type relays and controls which prevent assembly unless parts are correctly positioned, (2) Index table with both barrel type cam and shot bolt for accuracy and magnetic operation of index and dwell, (3) Positive dwell time control through synchronous timer and electrical interlock at each station, (4) Hardened and ground ways, (5) Automatic lubrication, (6) Electrical and pneumatic equipment to J.I.C.

Robbins special assembly machines save manpower, speed production and improve quality, often combine machining with assembly for further savings. Automatic inspection, selection, orientation, assembly and in-process gaging assure consistent high quality production. Ask us for recommendations to help solve your automatic assembly or machining problem.

OMER E. ROBBINS COMPANY
24794 PLYMOUTH ROAD • DETROIT 39, MICH.



Robbins
SPECIAL MACHINES

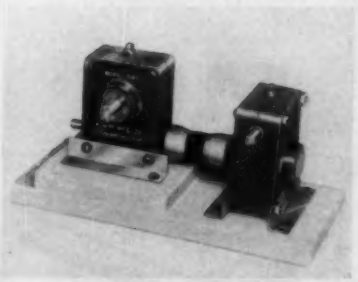
New brochure describes and illustrates a variety of Robbins special assembly machines. Write for your copy.

Power Kit for Foot-Operated Shears Reduces Operator Fatigue

Trippit power kit for foot-operated shears converts shears to a safe, positive electro-air operation, reducing operator fatigue and adding to his safety. Kit consists of a completely enclosed, electric foot pedal; a plug-in outlet for an electric counter which can be combined with a preset counter to stop machine after any desired quantity; and a compression cylinder which requires only one air-hose connection. Completely wired, entire kit sells for under $200, and can be installed in approx 1 hr.

General Automation Corp, 100 West End Ave. New York. NY

PERFORATING UNIT, Unipunch Series B-5, punches round and shaped holes up to 3½-in. dia in mild steel up to ⅛ in. thick. This 5-in.-wide holder is a lightweight aluminum-alloy casting with a steel insert in the guide hole to minimize wear and assure retention of concentricity. Units are available with 8, 12, and 16-in. throat depth—*Punch Products Corp, 3800 Highland Ave, Niagara Falls, NY*



LOWCOST SPEED REDUCERS for fractional-hp motors are available with ratios of 15:1, 20:1, 30:1, 48:1, and 60:1. Combinations of these reducers will produce units with ratios from 225:1 to 3600:1. Units have molded nylon gear and precision machined steel worm. Case is molded polyester. Size of unit: 2⅝ in. wide, 1⅜ in. deep, 3⅜ in. high—*Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio*

WILLIAMS

TOOLS OF INDUSTRY

FOREMOST! *Since...*

- Famous old "999" scorched the rails at 112 mph in 1893
- The "Oceanic" ushered in the luxury ocean liner era in 1870
- The 5th Ave. Double-deck bus appeared in 1905
- The year of the Model T, 1908, led to America on wheels
- Cross-country air service in 1938 introduced mass air travel

Since 1882, Wiliams has anticipated the tool requirements for production and maintenance in the transportation industry. Among the hundreds of patterns and sizes of tools which Williams forges are Carbon Steel Wrenches... Alloy Steel Superrenches® and Supersockets®... and a wide range of extra tough "C" Clamps.

TODAY... Williams makes the *Broadest Line of Its Kind* for this and other important industries. Write for Catalog 303.

YOU GET QUICKEST DELIVERY AT LOWEST COST FROM YOUR LOCAL DISTRIBUTOR.

J. H. WILLIAMS & CO.

497 Vulcan St., Buffalo 7, N. Y.

BUFFALO • NEW YORK • CHICAGO • LOS ANGELES

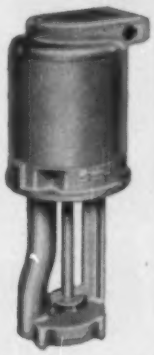
CONNECT THEM . . . FORGET THEM . . .

Ruthman Gusher COOLANT PUMPS

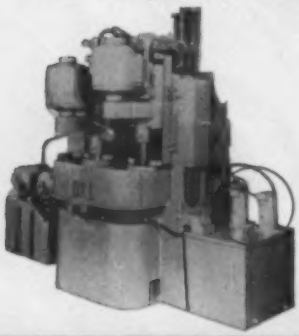
REQUIRE LITTLE MAINTENANCE

Ordinarily Gusher Coolant Pumps require no attention. Because there are no packing glands to adjust and they are equipped with heavy duty prelubricated for life, ball bearings. Your maintenance worries are minimized when you specify Gusher Pumps. **Write for our Catalog.**

THERE'S A GUSHER FOR EVERY REQUIREMENT



Model 6-P3 Immersed Type



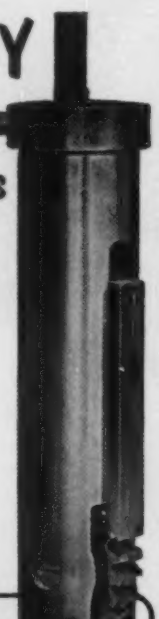
Illustrated is a Springfield Dual Spindle Vertical Grinder equipped with Gusher Coolant Pumps.

Ruthman MACHINERY CO.

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

1818 Reading Road, Cincinnati, Ohio

The INSIDE STORY about NATIONAL Keyseating Millers

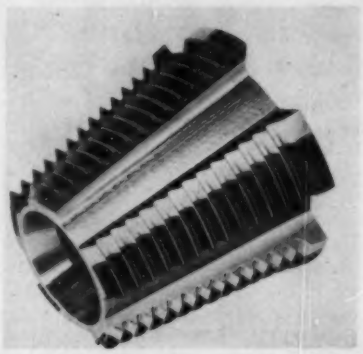


NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed steel which are hardened to Rockwell specifications and accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17 complete, handy size



TAPS AND THREAD MILLING CUTTERS designed for threading abrasive materials such as aluminum, magnesium, and plastics are available in solid carbide or shell-type carbide-tipped models—*Detroit Tap & Tool Co, 8615 E Eight Mile Rd, Baseline, Mich*

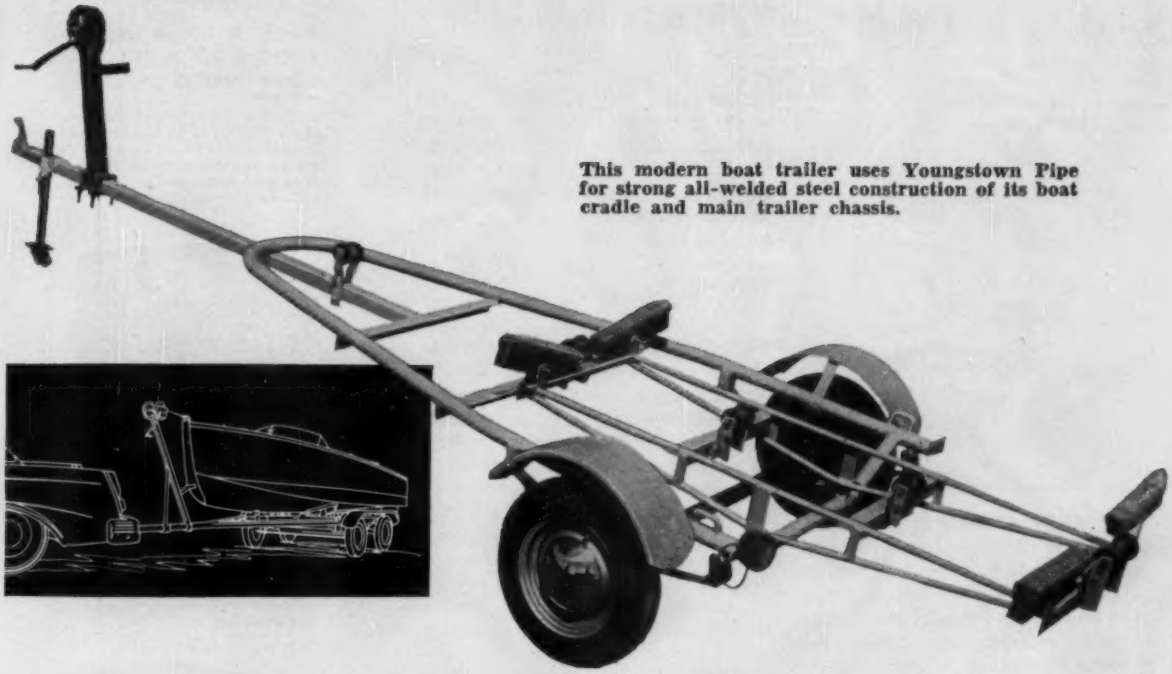
Oxygen Cylinder Manifold Handles Any Number of Cylinders

Oxweld M-35 accommodates two cylinders as a basic unit, one on each side of the operating controls. Straight or curved extensions can then be added in single or double rows to either bank.

One bank can be operated independently while cylinders in the other bank are in reserve or being changed. When large flows are needed both banks can be operated simultaneously. During alternate operation, reserve bank automatically picks up the oxygen load when supply in operating bank is exhausted.

Linde Co, division of Union Carbide Corp, 30 E 42nd St, New York 17, NY

DIVIDER SETTING DEVICE called Leytool is a British product designed for draftsmen, engineers, layout men, and toolmakers. Silver-plated vernier scale permits accuracy in setting to 0.001 in. Price: $7.50—*Distributed by Air Transport Equipment, Inc, Albany Ave, Amityville, LI, NY*



This modern boat trailer uses Youngstown Pipe for strong all-welded steel construction of its boat cradle and main trailer chassis.

YOUNGSTOWN CONTINUOUS WELD PIPE

. . . provides extra-strength chassis for "Texan" boat trailers

Here's an unusual application for steel pipe. "Texan" Boat Trailers, produced by the Cunningham Trailer Works of Lubbock, Texas, are fabricated from Youngstown Pipe to provide users maximum cargo protection as well as greatest ease during loading, unloading and while making the haul.

In line with Cunningham's policy of using only the highest quality raw materials, they wisely specify Youngstown Continuous Weld Pipe for fabrication of both the boat cradle and main trailer chassis. This gives Texan boat trailers a sturdy welded steel construction able to withstand the most rugged use—on or off the highway. Why not use Youngstown Pipe structurally to build strength and quality into your products?

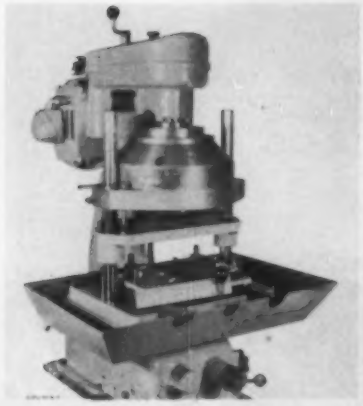
Your local Youngstown Distributor is the man to call when you want quality pipe—day or night. He has a complete stock and his on-the-spot fast delivery will help keep your operations humming along at top speed. Why not call him today?

Next time you need pipe—for any purpose — specify Youngstown and secure these 7 Points of uniform goodness

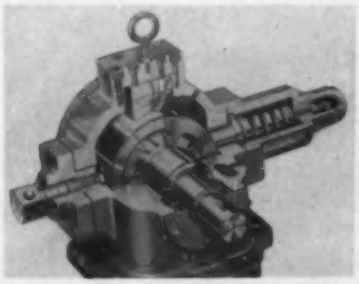
uniform ductility
uniform lengths
uniform threading
uniform weldability
uniform wall thickness and size
uniform strength and toughness
uniform roundness and straightness

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities



GEARLESS DRILL HEAD can be added to line of small drillpresses. Table carries an indexing fixture so that 25 spindles will drill a total of 50 holes, 25 in each pass. Travel of table, feed into drills, and return travel downward of table take place in automatic cycle. Hydraulic cylinder in base actuates table—*Zagar Inc, 23886 Lakeland Blvd Cleveland 23, Ohio*



Variable Volume Hydraulic Pump Delivers 40 gpm at 1200 rpm

Model R pump is said to be ideally suited for use in machine tool feed systems, hydraulic presses, and mobile equipment. It delivers 40 gpm at 1200 rpm, and is designed for 1000-psi continuous operating pressure and 1250 psi for intermittent operation. Volume selector adjustment is standard equipment and allows delivery to be manually adjusted to exact circuit requirements.

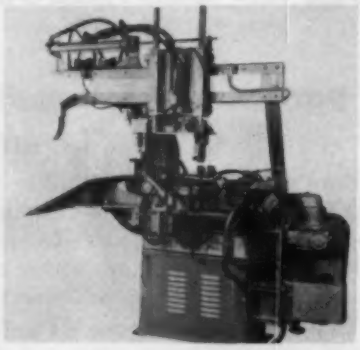
Racine Hydraulics & Machinery, Inc, Racine, Wis

Nylon webbing slings are offered in two series. Liftex neoprene buffer slings are made with a nylon-cored buffer strip 1¾ in. wide and 0.125 in. thick. These are available in reversed-eye models in 2, 3½, and 6-in. widths, with safe working load ranges from 5000 to 13,500 lb and safety factor of 5 to 1. Economical Liftex nylon slings have a safe working load of 2800 lb in basket hitch and 1050 lb in choker hitch. These have a safety factor of 5 to 1 and come in 1¾-in. width.

Caldwell Co, Inc, 1122 Fourth Ave, Rockford, Ill

Vibration pad, designated Waffle-Grip Elasto-Rib, consists of layer of resilient cork permanently bonded between two layers of oil-resistant neoprene which have been embossed in a unique waffle-type pattern. It is made in two types: standard capacity for loads to 60 psi, and high capacity for loads to 120 psi. Cross-rib construction increases pad deflection, and also provides an unbroken perimeter which prevents dirt and cuttings from accumulating under pad.

Korfund Co, Inc, 48-39B 32nd Place, Long Island City 1, NY



ENDS OF LONG CURVED TUBES that form part of an automobile exhaust crossover assembly are joined by special flash butt welder. Unit, rated at 75 kva, processes parts at rate of 240 per hr. Upper structure is pick-up and transfer mechanism for automatic unloading — *Taylor-Winfield Corp, Warren, Ohio*

Parts cleaner, designated Air-Push Spragit, works with any immersion cleaning fluid, and is quickly adapted to the cover of any standard 5 or 10-gal metal container. Basket fits inside container and is agitated by rocker-arm assembly which is actuated by air pressure. Unit operates on as little as 12 lb of air, and will handle a load of 75 lb at 60 psi. Stroke and cycle are adjustable.

Sprague Devices, Inc., Michigan City, Ind

(Advertisement)

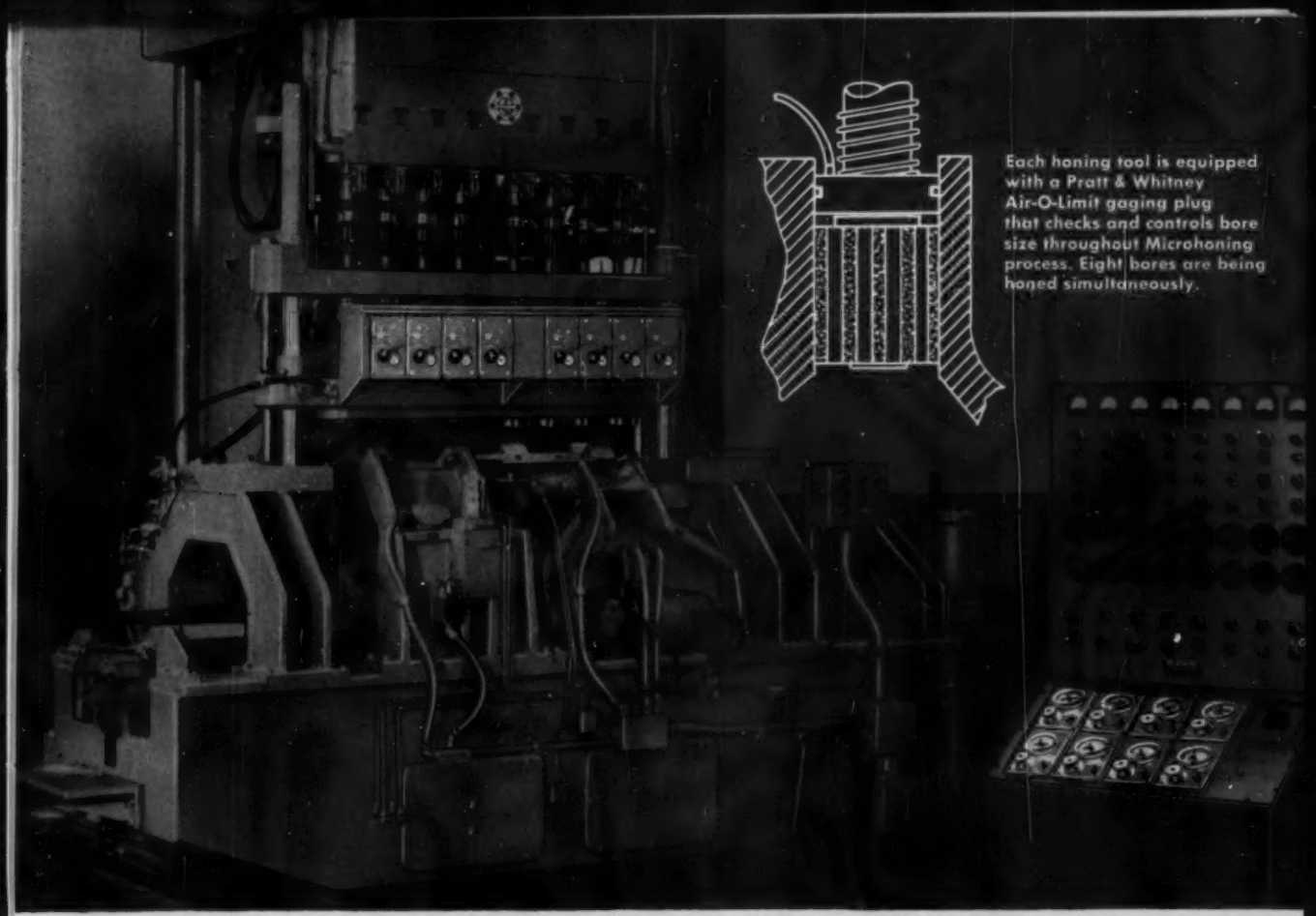
BUILD A GAGE INSTALLATION TO SUIT YOUR NEEDS . . .

with these packaged, on-the-shelf P&W Air-O-Limit Light Signal Units. Can be used to signal operator or to provide feed-back impulse for fully automatic process control.

BASIC 2-LIMIT UNIT . . . indicates high and low tolerances. Suitable for sorting and other "yes-or-no" control applications.

3-LIMIT UNIT . . . especially suited for grinding and similar operations. Indicates or automatically controls such conditions as: "Fast Feed," "Slow Feed," and "Spark-Out."

4-LIMIT UNIT . . . similar to 3-Limit Unit, but provides greater control scope. Indicates or controls such conditions as: "Approach High Limit," "High Limit," "Approach Low Limit" and "Low Limit."



Each honing tool is equipped with a Pratt & Whitney Air-O-Limit gaging plug that checks and controls bore size throughout Microhoning process. Eight bores are being honed simultaneously.

PHOTO COURTESY OF MICROMATIC HONE CORPORATION, DETROIT, MICH.

Make Your Investment in Precision Pay Off in PRODUCTION

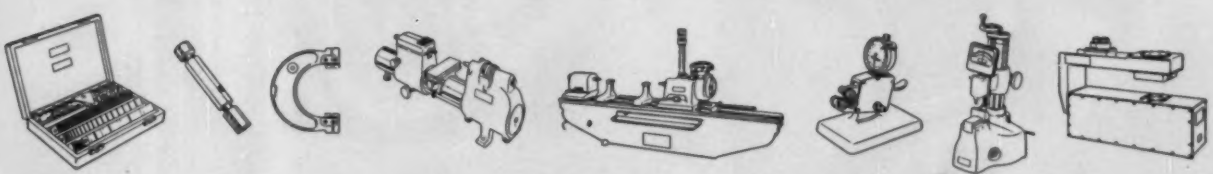
• • • WITH PRATT & WHITNEY "PACKAGED" AUTOMATION GAGE UNITS

Applied to your precision production machines, "P&W Automation Gaging" will make it possible for you to increase production, reduce scrap losses and put to work more effectively the high precision built into your equipment. And in addition, the use of Pratt & Whitney standard, on-the-shelf Packaged Gage Units will provide an installation *custom-tailored* to your exact needs *WITHOUT* the expense and delays involved in engineering and constructing special controls.

In this example – a Micromatic Hydrohoner – automotive cylinder blocks are gaged *during* the Microhoning process. When final size is reached, the machine is automatically shut off and the Microhoning tools are retracted. A change to a different bore size can be made, without stopping the machine, by a simple adjustment on a calibrated gage control dial. Visual indication is given of the accuracy of the new adjustment. Cylinder blocks are produced at a rate of 120 per hour. Reject and scrap losses are virtually eliminated.

Make the most of *your* investment . . . make it a point to call in a P&W Field Engineer to analyze your production requirements and recommend the right P&W Automation Gaging installation to help you increase output, improve accuracy and reduce reject losses.

Pratt & Whitney Company, Incorporated,
11 Charter Oak Boulevard, West Hartford, Connecticut.



GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS . . . STANDARD MEASURING MACHINES . . . COMPARATORS . . . AUTOMATION AND CONTINUOUS GAGES

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

New technical booklet contains .

LATEST INFORMATION ABOUT USS "T-1" STEEL

Send the coupon for your free copy!

It tells **Where** to use USS "T-1" Steel!
When to use it!
How to use it!

Get this newly revised compilation of technical and application data.

It will help you design and work with this remarkable constructional alloy steel.

REMEMBER

No other steel possesses "T-1's" remarkable combination of high yield strength, toughness and weldability. Send the coupon for design and fabrication data.

ALL-NEW TECHNICAL BOOKLET!

United States Steel
Room 5629, 525 William Penn Place
Pittsburgh 30, Pennsylvania

Please send a copy of your new booklet, USS "T-1."

NAME AND TITLE _____

_____

FIRM _____

ADDRESS _____

CITY _____ **STATE** _____

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks.

Watch the **United States Steel Hour** on TV every other Wednesday (10 p.m. Eastern time).

UNITED STATES STEEL

Cold-Heading Costs Far Less . . .

WITH P&W-JAQUITH CARBIDE HEADER DIES, PUNCHES, CUT-OFF QUILLS AND KNIVES . . .

Compared with steel tooling, they run longer, produce more and require lower inventories. Improved quality increases product acceptability, cuts inspection costs. These carbide tools are now offered as stock items for National and Waterbury Farrel Cold Heading machines. Specials can be furnished on short delivery from available blanks.

Write now for complete information. Jaquith Carbide Division, Pratt & Whitney Company, Inc., 17 Stewart Street, Lynn, Massachusetts.

JAQUITH CARBIDE
DIVISION OF PRATT & WHITNEY COMPANY, INC.
SPECIAL DIES • COLD HEADER PARTS • WEAR PARTS

Round Table . .

VIBRATING NERVES

Is it possible for a worker to become accustomed to the noise of his own machine, yet be bothered by the sounds of a less noisy machine next to him?

A WORKER's complaint that a new punch press recently installed in his working vicinity is making too much noise should be given serious consideration by the foreman. Although the worker's own machine is noisier, and doesn't seem to bother him, the fact remains that noises aren't all the same. It is possible that the new high-speed punch press is an annoying noise-maker that demands remedial action.

Industrial noise is a production thief that does affect worker efficiency. But how much a given noise bothers a worker depends on the conditions of work and the type and intensity of noise produced. In a factory, workers expect a certain amount of noise, and they make a fuss only when it approaches the level of pain. In an office, however, a lower level of noise can cause complaints. Causes of annoyance are not only loudness, but also suddenness, inappropriateness, intermittency, and reverberation. It seems to be the shock attached to noise, as well as the intensity, that makes people notice it. Noise that is not a surprise

"I wouldn't say that he's strictly a 'yes' man. When the boss says no he says no."

is not as annoying. Thus people do not notice noise they make themselves, even though it may be loud; but they do object to the same noise made by others, primarily because they have control over their own noise and can prepare to hear it. But the other noise comes as a surprise, and no preparation can be made. This is why a punch-press operator may object to the noise of hammering in the background when the hammering is not as loud as the grinding and clank of his press.

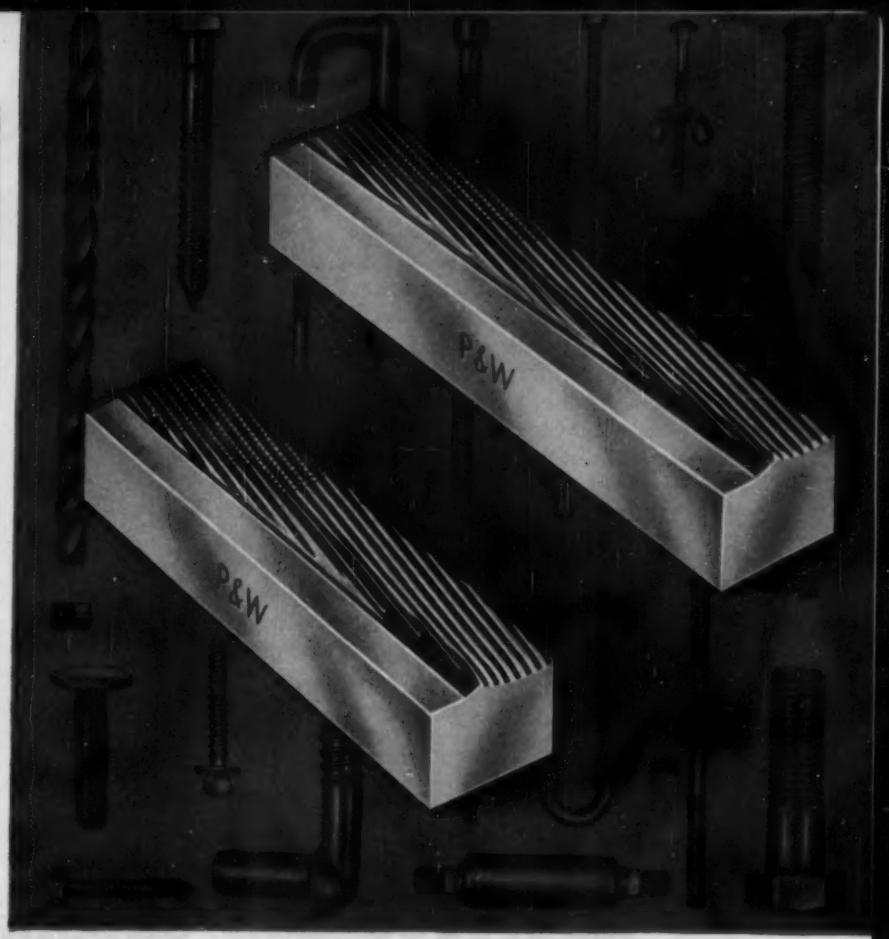
Industrial noise is a shop problem that is receiving technical attention and study for its reduction. I have been in shops where you communicated by shouting in an ear to be heard above the din. There is no question that it does affect production and equipment. It is a known fact that noise and vibrations damage delicate machine parts and shake high-speed mechanisms out of adjustment. From the human angle, excessive sound hurts us, puts our nerves on edge, and loses us concentration and efficiency. Undoubtedly, constant noise in the factory reduces the worker's hearing ability, and may actually damage eardrums.

I believe that the best approach to reduction of noise is the easiest. We should concentrate on the most obvious irritating and damaging sounds because they are probably the worst. If a given percentage of the normal factory roar can be cut down, then production may be raised. If it is possible to cut out the noises and vibrations to which actual damage can be traced, we can eliminate some broken eardrums and damaged equipment.

The effect of noise on workers is not a minor matter. Improperly designed and mounted machines can cause partial deafness and sometimes complete deafness. It is therefore important when a worker complains of noise annoyance to check into the cause. Because the normal human being is often loath to do the things he should for his own safety, like using goggles when grinding a tool, the use of ear plugs should be mandatory where noise is objectionable. Ear plugs are a cheap, sensible, and fully effective solution to extra-loud sounds where men must work without any practical method of avoiding injury to hearing any other way. But they should not be considered a permanent and only solution to the noise problem.

Aside from the provision of ear plugs for workers, the reduction of industrial noise is also a responsi-

(Continued on page 240)



ROLLING Produces More Accurate Threads...FASTER!

WITH P&W-STERLING THREAD ROLLING DIES

. . . Thread Rolling is rapidly replacing older production methods. Long-wearing P&W-Sterling Dies produce threads that are more uniform and accurate than cut threads and have a hard, burnished finish. Important savings in material are realized. Production rates are very high, production costs low. Sterling Dies are stocked and sold by the P&W Branch Office near you.

Write today for complete information. Sterling Die Division, Pratt & Whitney Company, Inc., 13811 Enterprise Ave., Cleveland 11, Ohio.

STERLING DIE
DIVISION OF PRATT & WHITNEY COMPANY, INC.
THREAD ROLLING DIES FOR ALL APPLICATIONS

You can expand your plant,

for production men

This Avey machine drills various patterns of holes in jet engine parts by changing program drums or by alternating two automatically-driven locators which position the table accurately from a radial position. Program drum also programs one or more of the four drilling units for drilling, reaming, and similar operations.

The machine consists entirely of standard Avey units: four Aveydraulic automatic units with 12″ feed; cast iron columns; 120″ fan type steel base; 60″ Electrodex table. Top column and unit have an in-and-out traverse of 20″. The ways are mounted on steel adaptor blocks which can be removed for different heights.

All units and the index table are push button-controlled.

If you're looking for flexibility in a special machine, your Avey man's the man to see.

for management

The pressure to expand is terrific on managements who want to be prepared for the rocketing market growth predicted for the next 10 years. They realize that they will probably lose ground by standing still, but they also want to protect their balance sheets, and their peace of mind, from heavy debt due to adding costly plant space.

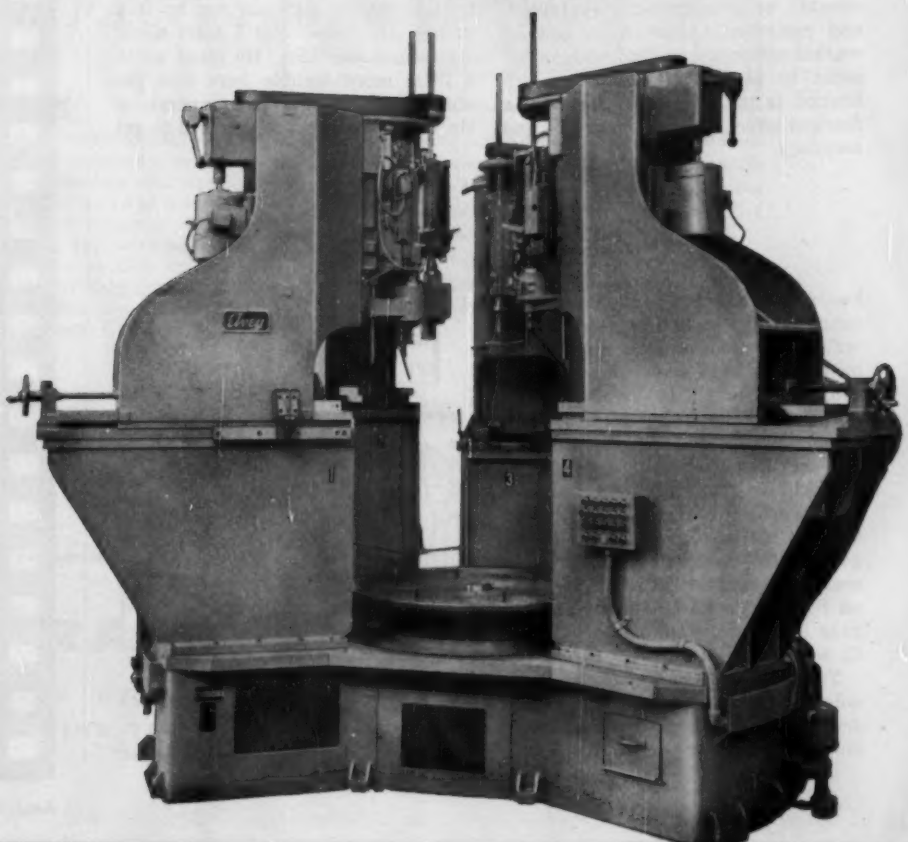
Avey production machines offer a quick and economical means of achieving the primary objective of expansion: increased productive capacity. They concentrate many operations in a comparatively small area, and free both floor space and labor for other productive operations. Their production rate enables you to increase your sales volume; and their fast pay-off rate gives you substantial earnings on your investment in a short time. Their unitized construction permits economical re-engineering to handle new parts or design changes.

AVEY DIVISION, THE MOTCH & MERRYWEATHER MACHINERY CO., BOX 625 CINCINNATI 1, OHIO

drilling, tapping, production machines

and sleep well too

Avey



bility of management. It can be reduced by dampening or isolating the noise close to the source with vibration-reducing mounts that smooth out heavy physical vibrations. Most industrial plants have ample chances to get at noise through this method. The idea is to break the solid, vibration-conducting circuit from the machine frame to the floor, or between machine members, by inserting material that will still provide the necessary support but which will not transmit the vibrations. Simple pads, made of materials that will absorb vibrations, can be used to mount almost any static equipment. Heavy, low-frequency noises of pounding, grinding, and wearing are effectively dampened by such elastic mounts. The equipment will still vibrate, but its shaking and lurching will be absorbed mainly by the pads.

Noise can also be eliminated at the source, where machine parts rotate and clash together, by designing the vibration and noise out of the equipment that sets up the racket. Machine designers and manufacturers recognize the necessity of this measure to eliminate the source of noise through a detailed study of kinetics and materials in the design of the equipment.

Noise is an important shop problem. Complaints from workers about objectionable noise from machines should be recognized, evaluated, and remedied. Aside from loss of worker efficiency, and possible detriment to health, low-frequency vibration is the area noise that has a marked effect on equipment life and accuracy.

Harry Kaufman
Philadelphia, Penna

FROM experience, I should say Ed cannot afford to lightly dismiss Ritter's complaint about the noise made by the new high speed punch press, simply because his own press is noisier and its noise doesn't seem to worry him. It really doesn't follow that Ritter's nervous system can "absorb" *any* kind of noise. Unless Ed has reason to doubt Ritter's good faith in the matter of complaints in general, this complaint will certainly merit some investigation. If Ed looks on Ritter as a normal man, his attitude to the grouse is superficial and ill advised.

For instance, I am reasonably insulated against noise, but certain noises seem to tear my nerves to shreds. One member of my family makes an appalling noise when sneezing. This particular sound, which fortunately occurs only at infrequent intervals, causes pronounced shock to pass through my entire nervous system, and I shudder to contemplate the effect on my nerves were this particular noise to be continuous or even frequently repeated. I have a fellow feeling for Ritter; the new noise, continuously repeated, seems to be his bete noir.

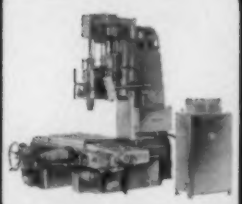
A man may be insensitive to many noises and acutely sensitive to a few. A boiler shop with its clanging and riveting noises holds no terrors for me, while a freak sneeze shatters me. I assume it will be much the same with most people and look forward to your other readers' views on this poser. It may be that Ritter has got sufficiently used to the noise of his own machine not to be aware of it. When he started working that machine it may have annoyed him just as much as does the new high speed press now installed next door to him.

Possibly if he perseveringly suffered in silence long enough, he'd get used to the noise of the new model too, but that would be asking a lot from Ritter and might affect his production adversely. Ed should know his men and should be in little doubt re the veracity of Ritter's objection. True, he says it's obvious Ritter's just trying to make trouble, but doesn't suggest he is a known grumbler. No! I don't think Ed should can him. He must go to a little more trouble here and get views from other nearby operators. He would also be well advised to get

"No, sir, we haven't found your glasses yet."

Because
"SEEING IS BELIEVING"
let this film show you how

THE
PRATT & WHITNEY
Electrolimit
JIG BORER



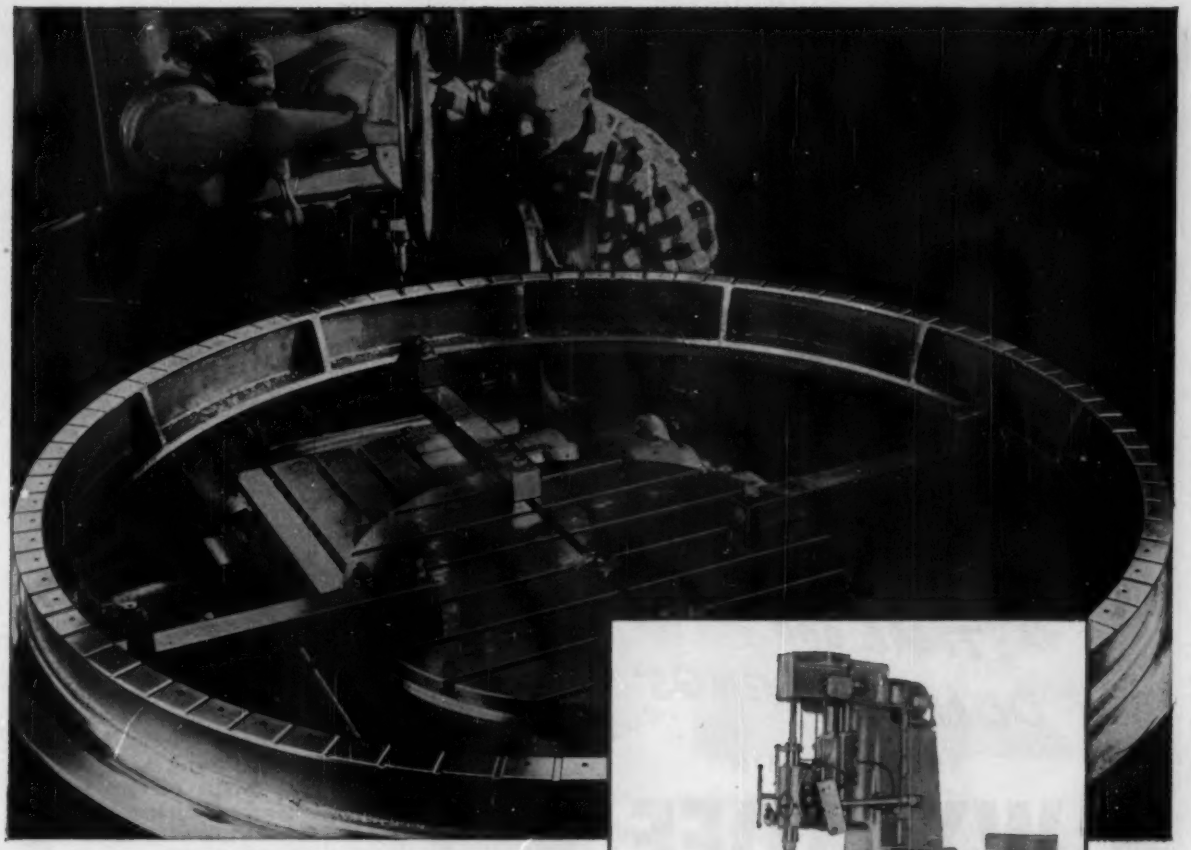
- **INCREASES ACCURACY**
- **HELPS ELIMINATE COSTLY ERRORS**
- **IMPROVES WORK QUALITY**

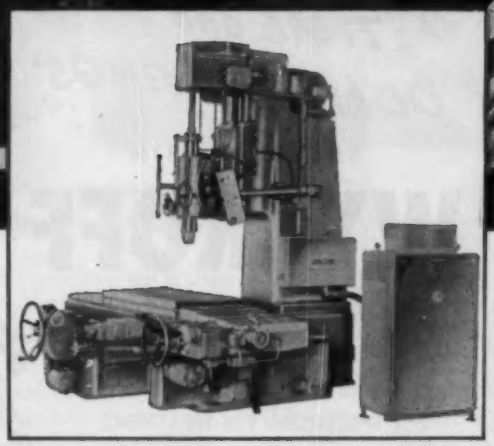
And
- **REDUCES PRODUCTION COSTS IN THE TOOLROOM *AND ON THE PRODUCTION LINE!***

Arrange Now . . .
for a showing of the new 16 mm sound motion picture film in full color,
"ACCENT ON ACCURACY"

Write on your company letterhead to Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford 1, Conn.

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES
CUTTING TOOLS





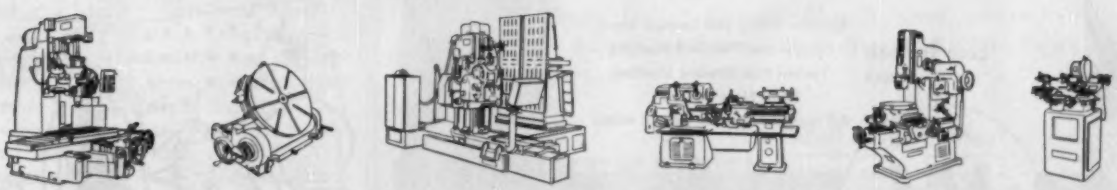
PRECISION plus BIG CAPACITY

P&W JIG BORERS WITH OPEN-SIDE CONSTRUCTION

Nearly 6 feet in diameter, the aircraft tooling fixture shown above was really big! It required machining 84 slots and boring 84 holes on the face and machining 84 slots on the flange. *All* 252 slots and holes had to be equally spaced and located within ± .001" of true radial. Handling jobs like this with ease and efficiency takes the combination of high precision and big work capacity you'll find only in a Pratt & Whitney Jig Borer with Open-Side Construction.

Pratt & Whitney Jig Borers – both Electrolimit and End-Measure types – are produced in complete lines for every work size requirement. All types and models will locate accurate to .0001" . . . and will retain this initial high precision and rigidity *indefinitely!* Get complete information now.

Write for your copy of Circular No. 587. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford 1, Connecticut.

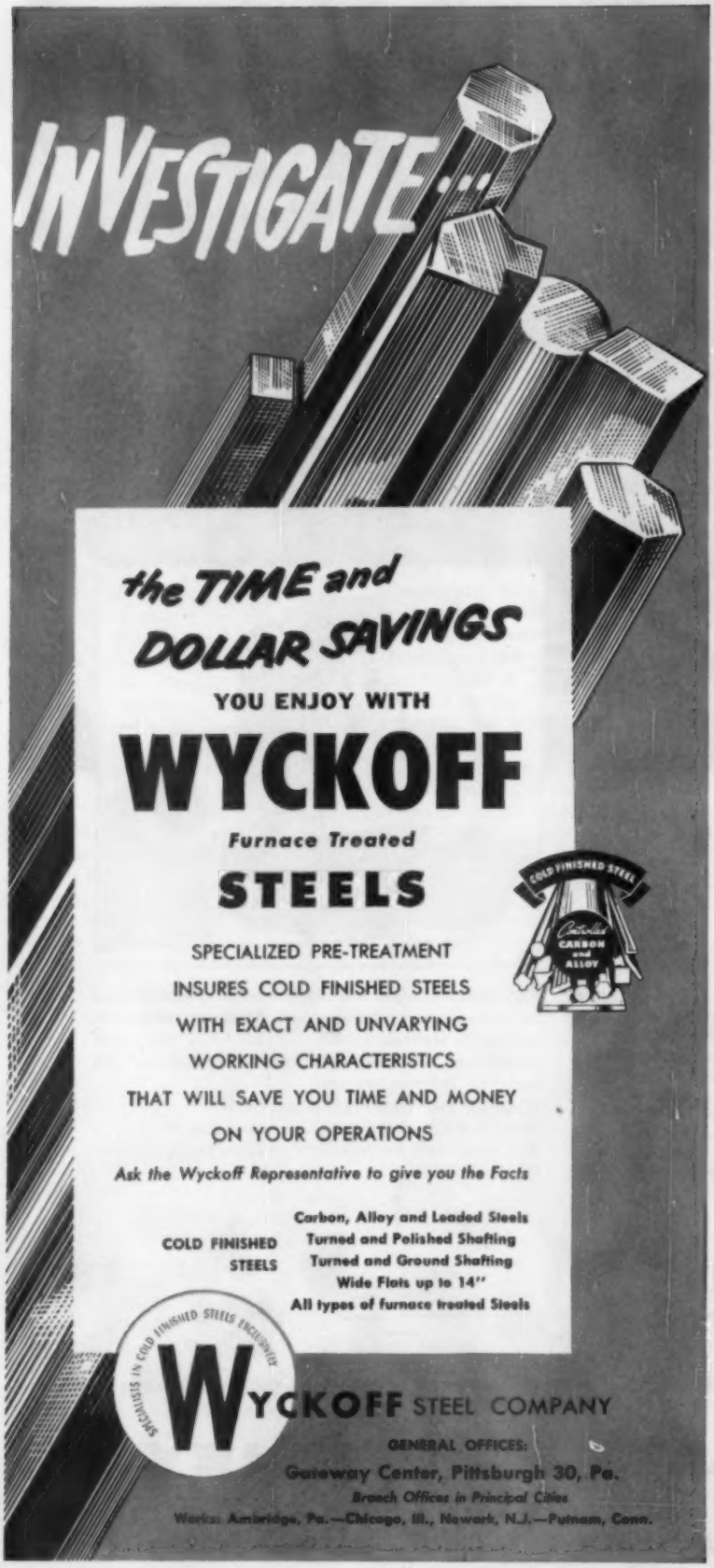


JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

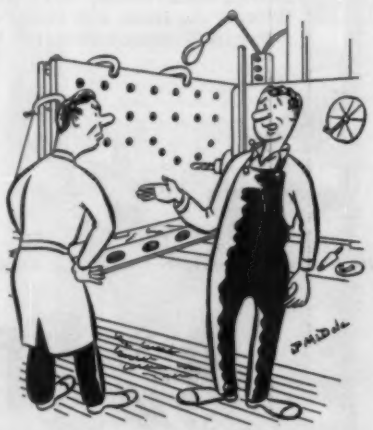


some advice from the works doctor. There really is no need for Ed to shoulder the whole responsibility in a case fraught with so many imponderables.

Undoubtedly, there is something in Al's suggestion that noises aren't all the same. In addition, different noises affect different people in different ways. Due to the after effects of two world wars, millions are unable to stand certain noises, and shell shock victims are particularly susceptible. Such victims are not confined to those who served with the forces. The civil population of Europe had bombing to contend with and it was no joke for those of us in, or on the fringe of large industrial centers.

My family were at the varsity stage in education during the bombing onslaught. They did their home work in a dugout in the back garden to the accompaniment of distant crumps and near misses. The results of that ghastly experience are reflected in the population today, and arrangements must be made in in-industry to insure that noise does not add unnecessary suffering to those who suffered blasting shock in their youth, and whose nervous system may be permanently impaired as a consequence. This may have nothing to do with the Ritter complaint, and I don't wish to labor the point but we in Britain have had it abundantly brought home to us that a given noise doesn't seriously affect all within hearing, and of those affected, not all experience the same pain or annoyance.

The foregoing are some of my reasons for suggesting that Ed should not approach this problem lightly or impulsively. He should not airily assume that Ritter just wants to make



"I got lost."

trouble. The works doctor should keep Ritter under observation and Ed should have his ear to the ground. If none of the others complain, so much the better; Ritter can safely be left to the doctor. In the event of other complaints, the noise coming from the new press could perhaps be modulated by the introduction of other less offending noises, external to the press.

On the whole, I think Ed would do well to listen to Al. I have vivid and painful recollection of making an awful bloomer under somewhat similar circumstances. Ed should make full investigation and recruit all available help. He should then place the facts, as he sees them, before Harrison, with a recommendation that an expert on such matters be employed to give an opinion on his and the doctor's findings. This certainly is a case in which it is better to be safe than sorry.

Donald Mack
Airdrie, Scotland

VACATION RIGHTS

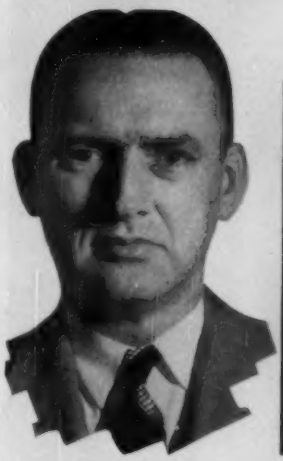
Should employees be required to work a full year before they're eligible for a vacation? Would it be practical to allow them to take it in separate days as they become eligible month by month?

SHOULD new employees have equal rights to vacation, or must they stick out a waiting period? My answer to the problem posed by this question is based on personal experience with vacation policies for production workers. I have found significant changes in recent years in vacation practices applicable to new shop employees. It is apparent that more employees with less than one year's service either get pro-rated or one week's vacation pay, instead of having to work a full year before they are eligible for such privileges.

Recent eligibility requirements governing vacations for new production employees seem to be wearing away from the rigid rule that one year's service must be put in before any vacation rights are earned. The trend seems to be to avoid penalizing the new man as far as vacation rights are concerned, and to give some vacation pay to the employee with less than a year's service with the company. However, in my opinion, I do not feel that a new man should get a full week's vacation pay, which is the policy in some companies. It would seem that the

Toledo Pipe Threading Machine Co.

Saves 50% on Tool Breakage with McCaskey Tool Control System



Mr. J. D. Alsman, Manufacturing Manager of the Toledo Pipe Threading Machine Co., writes:

". . . we are very pleased with the results of the McCaskey Tool Control System we recently installed . . . and feel that it will pay for itself within a six-month period . . .

"Immediately upon installation of the McCaskey System, the tool breakage began to decrease . . . and has now reached a point approximately 50% of the previous figure. The McCaskey system has also made it easier to maintain the minimum quantity of all tools without frequent excess purchase of any one item."

The McCaskey System can do this for your plant too—without additional crib personnel. McCaskey Systems are completely flexible—can be installed in your plant regardless of size or product.

Call your Victor Direct Factory Branch listed under "V" for Victor in the adding machine section of your Yellow Pages—or mail the coupon.

McCASKEY INDUSTRIAL CONTROLS
Production • Inventory • Tools • Maintenance • Costs
Division of
VICTOR ADDING MACHINE CO.
3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS

VICTOR-McCASKEY LIMITED,
GALT, ONTARIO, CANADA

Manufacturers of Business Machines Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.

Mail coupon today!

Victor Adding Machine Co.
McCaskey Industrial Division, Dept. AM-657
3900 North Rockwell St., Chicago 18, Ill.

Please send me your new booklet, "How Tool Costs Were Cut 12 Ways In 20 Plants."

Name .....
Position .....
Company .....
Address .....
City ..... Zone ..... State .....

dependable cutting

. . . WITH LENOX
BAND SAW BLADES

Tough flame-hardened teeth, uniformly set to a tolerance of .001", retain their razor-sharp edges even under strenuous cutting conditions.

Produced under exacting quality control and modern machining techniques, LENOX band saw blades perform consistently and accurately on all types of machines.

Engineering and research facilities are at your service for the solutions to your cutting problems and production questions. Call or write today for full information.

LENOX
THE TOOLS IN THE PLAID BOX

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD • MASSACHUSETTS • U. S. A.

granting of a pro-rata allowance of vacation based on length of employment is a more equitable arrangement.

There is no question that vacations for shop workers are a permanent part of the industrial scene. They are a recognized means of obtaining necessary relaxation, recreation, and relief from the rigors of continuous application to the demands of the job. Management realizes that the beneficial effects gained from vacations assure good production, loyalty, and cooperation from workers. But the practice of granting a full week's vacation to a new man with less than one year's employment with the company negates company requirements that costs of operation must not adversely affect attainment of reasonable profits.

Proponents of the policy of granting a week's vacation pay to the new man argue that this is a good device to raise production. However, in my opinion, this is only good in theory. Usually the new man isn't worth much to the company until he is trained in the particular skills and methods needed for his job. The company is losing enough productive time during the training period.

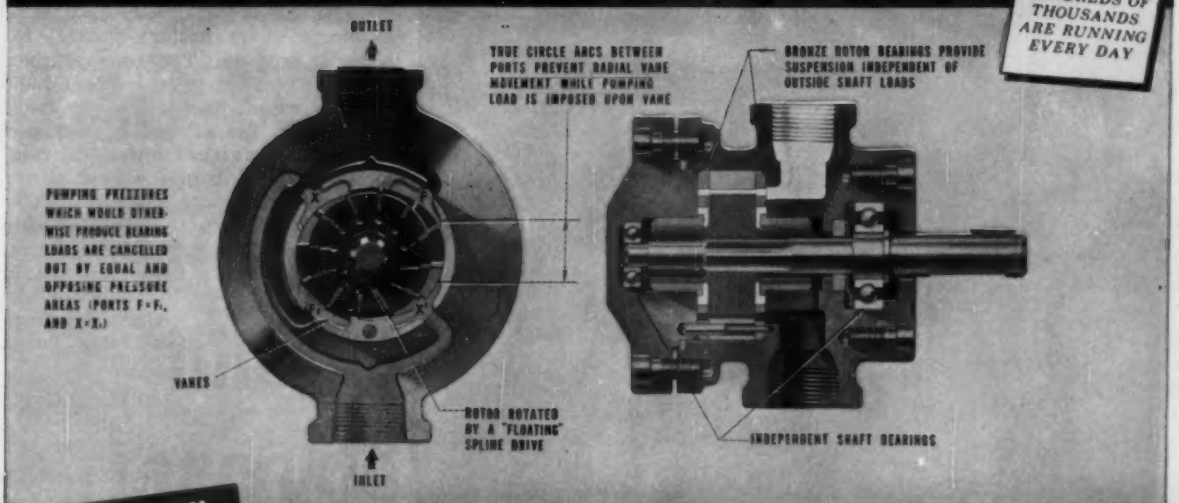
In the case under discussion, the new man has only been with the company a month; his value as a production worker has not yet been established. Nor is the company sure he well stay. For these reasons he is in no position to ask for vacation privileges. Vacation rights should be a privilege based on the

"OK, then . . . I'll see your toolbits and raise you a bolt!"

Question:

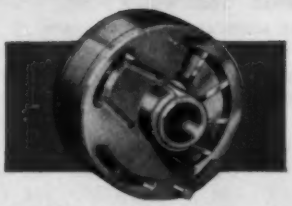
Why are VICKERS Balanced Vane Type Pumps the most widely used oil hydraulic power pumps?

HUNDREDS OF THOUSANDS ARE RUNNING EVERY DAY


OUTLET
TRUE CIRCLE ARCS BETWEEN PORTS PREVENT RADIAL VANE MOVEMENT WHILE PUMPING LOAD IS IMPOSED UPON VANE
BRONZE ROTOR BEARINGS PROVIDE SUSPENSION INDEPENDENT OF OUTSIDE SHAFT LOADS
PUMPING PRESSURES WHICH WOULD OTHERWISE PRODUCE BEARING LOADS ARE CANCELLED OUT BY EQUAL AND OPPOSING PRESSURE AREAS (PORTS F+F1 AND X+X1)
VANES
ROTOR ROTATED BY A "FLOATING" SPLINE DRIVE
INDEPENDENT SHAFT BEARINGS
INLET

Answer:

Because of their SUPERIOR PERFORMANCE and MANY OTHER BENEFITS for the user.



For more than two decades, the Vickers Balanced Vane Type has held the leading position among hydraulic power pumps . . . growing steadily in popularity. The various models (see below) are *the most widely used of all pumps in oil hydraulic service.*

Above is the pumping cartridge which is one of this pump's distinctive features. The many advantages listed at the right merit the thoughtful attention of anyone concerned with the selection and use of oil hydraulic pumps.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
MACHINERY HYDRAULIC DIVISION
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan
Application Engineering Offices: ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) MINNEAPOLIS • NEW YORK AREA (Summit, N. J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) SEATTLE • ST. LOUIS • TULSA • WASHINGTON WORCESTER
IN CANADA: Vickers-Sperry of Canada Ltd., Toronto

COMPLETE HYDRAULIC BALANCE—Each inlet and outlet port is balanced by another equal in size and radially opposite . . . pressure-induced bearing loads are thus eliminated. Pressure-balanced porting plates maintain ideal running clearances.

FLOATING SPLINE DRIVE—Rotor is driven by a "floating" spline. Rotor and shaft have separate bearings . . . avoiding strain from drive misalignment.

TRUE-CIRCLE CAM ARCS between ports prevent radial vane movement while pumping load is imposed upon vanes. Wear between vanes and rotor is thus practically eliminated.

ABILITY TO TOLERATE DIRT—Clean oil is of great importance in a hydraulic circuit; but, in spite of care, dirt sometimes gets in. The Vickers Vane Type Pump will pass a reasonable amount of dirt without trouble and without grinding it up.

REPLACEABLE CARTRIDGE—Cartridge (illustrated above left) contains all pumping parts that move . . . none contact the housing. Working parts can be removed and inspected without disconnecting piping or drive coupling. Replacement cartridge kits are available and pumps need not be sent to the factory for repairs. Pump capacity can be changed by simply changing cartridge in the field.

HIGHER EFFICIENCY—Tests prove exceptionally high volumetric and overall efficiency . . . not only when pump is new but also after long service.

AUTOMATIC WEAR COMPENSATION—Vanes are held in contact with the cam ring by centrifugal force and hydraulic pressure. If wear occurs, vanes revolve in a slightly larger orbit without appreciable change in performance.

MINIMUM MAINTENANCE—Hydraulic balance . . . floating spline drive . . . independent bearings . . . automatic wear compensation eliminate the most important causes for maintenance and repair.

TEMPERATURE ADAPTABILITY—Correct running clearances are automatically maintained which compensate for wide variation in oil viscosity resulting from temperature variation.

LONGER LIFE—The numerous features mentioned above that keep down maintenance also contribute to longer life. Then, a new cartridge completely rejuvenates the pump.

CONSTRUCTION SIMPLICITY is evident from the illustrations above. This simplicity is another reason for the superiority of Vickers Vane Pumps. For further information, ask for Bulletin 5002A.

7182

ALL MODELS HAVE THE VICKERS ADVANTAGES MENTIONED ABOVE

Single Stage. Pressures to 1,000 psi. Capacities to 55 gpm.

Two Stage. Pressures to 2,000 psi. Capacities to 55 gpm.

Double Pump—Two pumps for separate circuits driven by common shaft.

Two-Pressure Pump automatically delivers larger volume at low pressure and smaller volume at high pressure.

Second-hand test answers:

Should you replace your air compressor NOW?

An air compressor that *runs* well can fool you into thinking, "It *works* well, too!" Fact is, it may be running far more than it should, and inflating your compressed-air costs way out of proportion. That's because current consumption is the major expense item for compressed air.

A simple test with your own watch quickly and accurately tells if you'll be money ahead to install a new DeVilbiss compressor now. You may find you're already paying for a new compressor through too high operating costs! Phone your DeVilbiss jobber for DeVilbiss Compressor Form CL-b, containing test details. *The DeVilbiss Company, Toledo 1, Ohio.*

FOR BETTER SERVICE, BUY

DEVILBISS

DeVilbiss air compressors, with low-friction design, in horizontal or vertical models, ¼ through 15 hp.

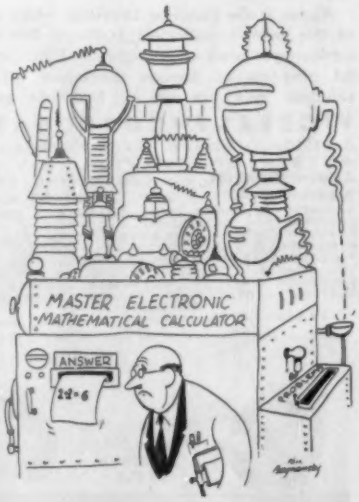
workers' worth and service with the company. Along this line of reasoning; a pro-rata allowance based on service would be most effective in handling this particular case.

There is no doubt that this is the "Age of Vacations." A generation or so ago almost nobody took them, except under doctor's orders. No male, anyhow. The common man couldn't afford to; the affluent felt ashamed to. Now everybody does. However, the saturation point has about been reached in workers' vacation rights. To give a new man a free week off with pay just because he switched jobs from one company to another is a luxury no organization can afford if it wants to stay in business.

Harry Kaufman
Philadelphia, Penna

IT HAS BEEN said "There usually is some good underlying reason for conventions;" the same might be said of rules and regulations. Holidays with pay for employees on an upstanding wage, usually staff men, was regarded as a solatium for hours worked in excess of the normal week. That was a ramp, often used by unscrupulous employers to wring a few hours extra out of their unfortunate employees, without having to pay for them.

The upstanding wage of earlier times covered a multitude of sins, and I recall an old foreman of mine who had been off sick for several weeks, having his pay docked in the third week. When he returned to work he complained to the owner,



this 140-TON horizontal milling machine

also bores and turns

There's never been one like it before!

Just a press of a button puts this mighty Schiess into action. A 25-ft. high column moves smoothly along 45-ft. long bedways. Never a vibration—no chatter—even at maximum transversal loads! The new Schiess design of the spindle heads has eliminated this!

THE MILLING OPERATION. A huge tungsten-carbide cutter in a 14¼" spindle goes to work on the stock. And performs its operation with a consistent accuracy—a surface-finish count—never before obtainable on such a big fellow.

THE BORING OPERATION. Another press of a button! Another spindle goes to work—bores a 79" depth in one cut—or a total depth of 118". Boring and milling spindles are provided with 36 speeds of which the top 12 are V-belt transmitted. Rapid traverse, feeds and manual controls of the two spindles are completely independent.

That this mighty machine has tremendous productive capacity is self-evident. And its productivity goes far beyond conventional milling and boring. Schiess attachments increase its scope to taper-milling, thread-cutting, copying and, in certain instances, copying in 3 dimensions. It's a time saver, too. Can go from feed to rapid traverse immediately, without complicated adjustments.

The Schiess Model FB 36/22.5 Horizontal Milling and Boring Machine is a product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess Engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all five FB models.

Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

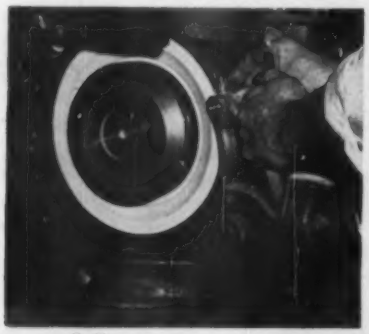
engineering division

SCHIESS

AMERICAN SCHIESS CORPORATION

1232 Penn Avenue, Pittsburgh 22, Pa.

problem: stop dust from causing health and morale problems.



problem: prevent dust from damaging costly precision machines.

answer: trap dust at its source with *unitized* Torit Dust Collectors.

Your workers are important . . . good personnel are becoming increasingly scarce. Portable, self-contained Torit units keep your employees healthy, satisfied and productive by collecting irritating dust. They protect your precision machines too—reduce costly maintenance and "down time." Many models and sizes available.

Free facts on dust problems and dust control. New 28 page, illustrated handbook is full of important, money-saving data. Contains charts, applications, details and specifications on all Torit equipment. Write today.

TORIT MANUFACTURING CO.
311 Walnut Street, St. Paul 2, Minn. Dept. 407

remarking "I understood I was on an upstanding wage" and got the snappy reply "So you are, so long's you're at your work." That boss conveniently ignored the fact that an upstanding wage covered sickness of reasonable duration. "Reasonable duration" is a somewhat elastic term which, in the old foreman's case wouldn't presumably, stretch beyond two weeks.

Life is full of qualifying periods and contradictions, and holidays with pay, for men on check, must be qualified for. As infants, we have the creeping period in qualifying for walking, the school period, the apprenticeship period, etc, during which we have the opportunity to gather unto ourselves the experience necessary for a successful career in life. We cannot escape them, we cannot jump the queue without injury to ourselves and others, the Jorgensons notwithstanding. A friend remarked, "Man's life is a series of contradictions. He comes into the world without his consent and leaves it against his will. When he is little, all the big girls kiss him and when he's big all the little girls kiss him."

It's rather a topsy-turvy business and the Jorgensons must take the rough with the smooth, like the rest of us. Industry is not a tourist agency or a holiday camp. It is the nucleus of our material wellbeing, around which we group ourselves in order to earn money that we may maintain our physical state in reasonable comfort. If withdrawals exceed deposits, we've had it. We could all have holidays with pay, and more besides, did we all deposit enough in the industrial kitty to meet the cost. The snag is, those who shout for most, mostly give least. They are a minority, of course, but that is no reason why they should be appeased and pandered to.

I am convinced there must be a qualifying period if holidays with pay is not to become another ramp, with the boot on the other foot. It would take up too much space to indicate all the reasons in support of that contention, they are so obvious. One way out occurs to me, it is the reverse of "Pay as you earn" as operated here in Britain by the inland revenue. It is earn as you pay. I am all against something for nothing. Holidays should be earned and paid for, not in currency but in length of service. I suggest holiday money should be paid each week, each employee receiving one fifty-second part of the total. That method would prevent abuse of the concession by the Jorgensons and put every employee on an equal footing. It would also teach the virtue and desirability of thrift in the individual. Picture the thrill of depositing their weekly installment in the savings bank!

If a man changes his job before qualifying for holiday pay, he cannot expect his new employer to make good that loss. I don't agree that an employee is penalized by a qualifying period. I regard it as a sensible arrangement, eminently fair, because it gives recognition to loyalty and service, giving no encouragement to gate crashers and irresponsible birds of passage. My proposal for paying holiday money in weekly installments would meet the case of a man having several employers in one year. Each employer would be responsible for his own portion, only. I really don't like this proposal, but offer it as a fair alternative if Al is losing sleep over the Jorgenson case.

Presumably, the length of service required before holiday money is earned will have been agreed on between employers and unions. That is how it is in Britain. If the same holds good in America, Jorgenson has no real grievance and, I rather suspect, no real interest in his job. Were employers to accept all the wild-cat schemes put forward by cranks, to put it mildly, they'd soon face a shut-down, and what would the Jorgensons do then, poor things? It could be that Jorgenson is more interested in holiday pay than in the actual holiday. That trick was so overworked here that many firms made a rule that all men in receipt

"That's the job for you—you were a state assemblyman once, weren't you?"

TAPPING TORQUE

No, you cannot buy torque tested taps from stock today, and perhaps you never will.

But, you can get the benefit of taps whose prototypes have been torque tested for hours on end. These prototypes are the taps which tell Greenfield engineers what features of a tap have the greatest effect on cutting ability, power consumption, wearlife, and overall strength.

Greenfield's electronic torque testers also help determine the "threadability" of new materials and new alloys of old materials.

"Educated guesses" are all right in their place, but for today's requirements we'll take an electronic tape recording.

TODAY'S RESEARCH IS
TOMORROW'S PAYOFF

GREENFIELD
TAP AND DIE CORPORATION, GREENFIELD, MASS.

BUY FROM YOUR **GREENFIELD DISTRIBUTOR** FOR SERVICE AND QUALITY

Photo courtesy of the Barber-Colman Company

THE LATHE — *Hendey No. 2E 14" General Purpose Lathe*

THE OPERATION — *Turning and facing an aluminum component*

THE CHUCK — *Horton, of course*

HORTON CHUCK DIVISION
Greenfield Tap and Die Corporation
Windsor Locks, Connecticut

HORTON
Since 1851
CHUCK

Call Your Horton Distributor Now!

so overworked here that many firms made a rule that all men in receipt of holiday pay must *take* their holidays.

Summer holidays in Britain are taken on an agreed month, usually July or August. During the holiday close-down, a number of men, in excess of the normal maintenance squad, are required for repairs and new plant installation. Those extra men get their holiday after the start-up. One or two conveniently forgot about the holidays they'd been paid to take and continued working. This was not noticed by some foremen, others turned a blind eye to the irregularity. In time, it became the thing to do, till the new rule cooked their goose.

As I write, a voice over the air announces a strike of electricians at a new atomic power plant, because the contractors won't guarantee them a sixty-five-hour week. That is the modern trend. The Jorgensons are not really interested in holidays. It's the dough they're after, and who would blame them if they are prepared to work for it? If Jorgenson's claim were met, he'd probably make an early move in search of another shop and another pseudo holiday. If holiday-pay concessions are as attractive in Sweden as Jorgenson claims, why does he continue to work in USA? There must be a reason. Were I in Al's shoes I'd tell him to go to . . . Sweden.

C D Mackinnon
Lanarkshire, Scotland

WARNING: SICK LEAVE A'COMING

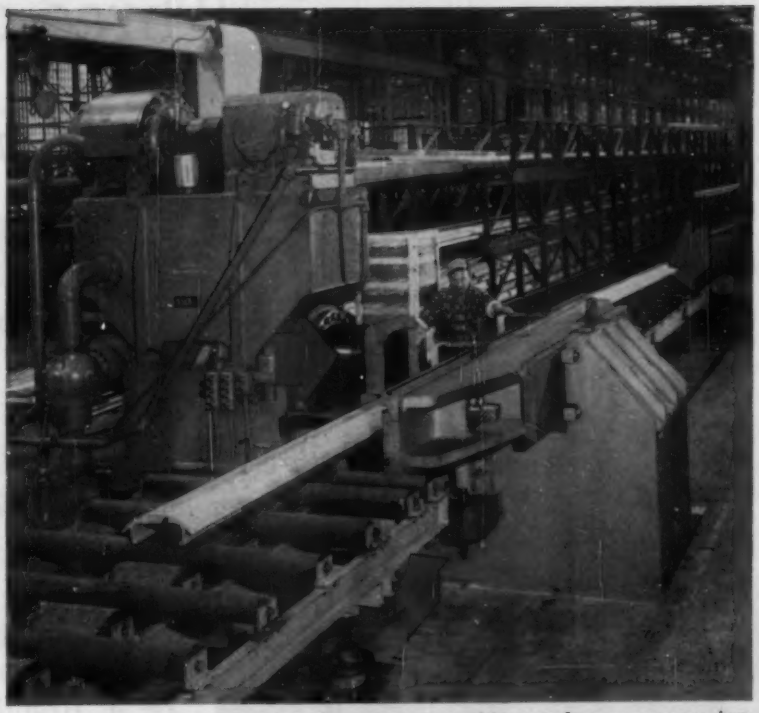
Could a plan be worked out whereby the men in the shop would tell their foreman in advance that they intend to take sick-leave days off for purposes other than illness? Would the knowledge help the foreman?

YES, the days of taking that extra day off are actually upon us. We now go to the ball game or fishing or for that cool swim "on the company" so to speak . . . sick leave it's called.

In the olden days we just stayed home and lost a good day's pay. Sure the boss was mad but isn't he always mad when someone upsets his production lines — so what, we got the extra day.

With the coming of the soft times and the easy touch we are now able to get together enough time so that it really doesn't cost us much to take off that day because we are

(Continued on page 252)



Live-roller conveyor moves work into press. Conveyor moves up or down to position work in die. Ram moves forward to straighten work. Entire installation, including press and conveyor, designed and built by Farquhar.

Kaiser Aluminum uses this Farquhar HORIZONTAL BULLDOZER PRESS for fast-cycle straightening

Aluminum extrusions, fed *continuously* to the press on Farquhar Live-Roller Conveyors, are straightened in a *fast-cycle operation* on this Farquhar 500-ton Horizontal Bulldozer Press. This efficient set-up is installed at the U. S. Air Force Heavy Press plant operated by Kaiser Aluminum & Chemical Corporation in Halethorpe, Maryland. In their own words this press is used "to eliminate natural bows and deformations which develop in some aluminum extrusions after they have been heat treated."

Like Kaiser Aluminum, major plants in this country have found that these Farquhar Horizontal Bulldozer Presses provide high production at low unit cost. Fed either by crane, overhead or in-line conveyors, they are used to economically forge, stamp, straighten or form parts in an efficient, fast-cycle operation.

Write for complete information on Farquhar Horizontal Bulldozer Presses or, better still, ask for our proposals or recommendations.

Farquhar Special Machinery Department . . .
Our qualified staff will build your special machinery economically—your inquiry will receive prompt attention.

A. B. FARQUHAR DIVISION
The Oliver Corporation
Press and Special Machinery Departments
York 16, Pennsylvania

OLIVER
Farquhar PRESSES
Also Manufacturers of Farquhar Conveyors

Three case histories

How 3 companies improved production by changing to

STANICUT Cutting Oils

Here are reports on three companies that have recorded (1) increases in production (2) better machine performance (3) longer tool life (4) money saved by switching to a STANICUT *Cutting Oil suited to their operations. You can get similar results.*

Standard Oil industrial lubrication specialist, Ray Wells, and Stuart Bergsma, G. A. Brevik manager, inspect carburetor needle valve. Ray recommended plant's switch to STANICUT Oil 137 BCS. He is well qualified to make such recommendations. Ray is a graduate of the Illinois Institute of Technology with a degree in engineering, and he has completed the Standard Oil Sales Engineering School. He has been an industrial lubrication specialist at Standard for six years.

G. A. Brevik Manufacturing Company uses STANICUT Oil 137 BCS

G. A. Brevik Manufacturing Company, Prescott, Michigan, is the largest producer of carburetor needle valves. The company was blending its cutting fluid from four different oils. Still they experienced tool breakage and ring formation on the surface of the stainless steel they were machining. Then one machine was converted to STANICUT Oil 137 BCS to test the oil's suitability for this operation. Soon all machines were converted.

Production increased 25% because of the improved performance of the machine tool. Cutting oil inventories have been reduced from four different oils to one. Tool life has been extended. There is no variation in fluids as there was when four oils were being blended, and there is no messy blending operation.

STANICUT Oil 137 BCS is ideally suited for severe, high speed machining.

A few of the stainless steel parts machined on automatic lathes at G. A. Brevik Manufacturing Company using STANICUT Oil 137 BCS.

STANDARD

Some of the pieces manufactured by Dearborn Centerless Grinding Co. Materials used are stainless steel, Inconel and Nichroloy.

Operator George Laverdiere and Standard Oil lubrication engineer, Leland J. Loomis, examine piece just off Cincinnati centerless grinder. Lee Loomis is another man who knows how to advise on metalworking problems. Lee has had ten years' experience in such work, has an engineering degree from Tri-State College and has graduated from the Standard Oil Company's Sales Engineering School.

Dearborn Centerless Grinding Co. uses STANICUT Oil 126 BCS

Difficult-to-grind stainless steel was the problem at Dearborn Centerless Grinding Company. Wheel loading and wheel break-down were such that soluble type oils weren't satisfactory. For this reason, Dearborn began using STANICUT Oil 126 BCS.

Company management found it secured these six important benefits by changing to STANICUT Oil 126 BCS in grinding operation:

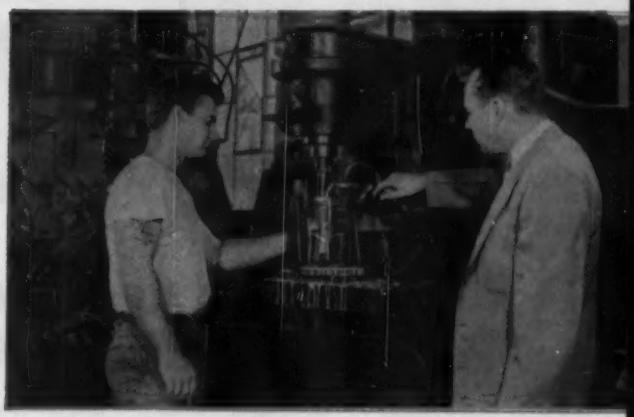
1. Better finishes.
2. More pieces obtained per wheel dress.
3. Superior wheel life obtained on profile jobs.
4. Harder wheels could be used.
5. Finer grit wheels could be used.
6. More stock per pass could be removed.

Woodford Manufacturing Company uses STANICUT Oil 155 CS

This Des Moines manufacturer was drilling and boring a steel wheel fork. Production was at the rate of 45 pieces per hour. Standard Oil lubrication specialist, Jess Nelson, called Woodford plant management's attention to the fact that STANICUT Oil 155 CS was being used successfully elsewhere in the plant. He suggested that much better production and longer tool life would be obtained if STANICUT was used in this operation.

The change, when made, increased production to 78 pieces per hour. Tool life was extended. At the same time, by using STANICUT Oil 155 CS, a 46% reduction in cutting oil costs was achieved.

STANICUT Oil 155 CS is an oil especially formulated for use in machining operations involving tough alloy steels which tend to tear and smear.

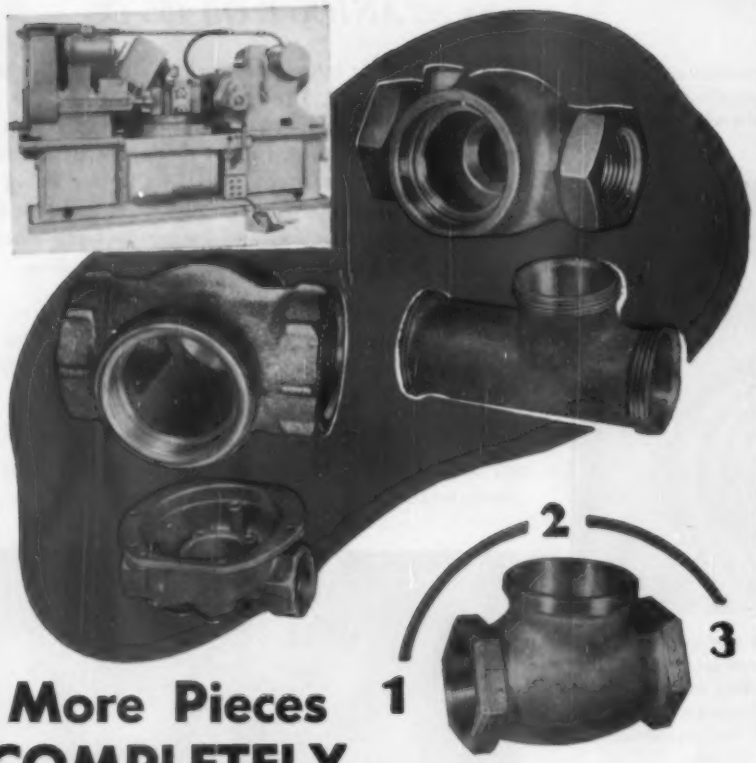


Woodford operator Elmer Light checks piece in Sundstrand Rigidmill while Standard Oil man Jess Nelson adjusts cutting oil flow. Jess, too, knows how to advise manufacturers on metalworking problems. He's had more than four years' experience doing such work. In addition, he has a degree in engineering from the University of Iowa and is a graduate of the Standard Oil Company's Sales Engineering School.

W. B. Noland, Woodford engineer, demonstrates Rollway Dock Plate to Jess Nelson. Parts machined using STANICUT Oil 155 CS are for this unit designed by Noland.

STANDARD OIL COMPANY (Indiana)

Get more data on STANICUT Cutting Oils from your Standard Oil industrial lubrication specialist. One of these men is nearby in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



More Pieces COMPLETELY *finished in less time on* GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & DeLeeuw feature provides for finishing machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

●

Send for illustrated literature which fully describes this recent Goss & DeLeeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS & DELEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

sick. The idea behind the social advance was a great one. It makes a great hit with all hourly workers and with some salary people, too. The principle back of the building up of accumulated leave-time was to enable those who became really sick to have protection and a more secure feeling that the job would be there when they returned. Yet always there is some clause which in the final analysis protects the company. So we, as workers, only have part of the grand advance in social accomplishment.

We build up time but if we don't get sick this year, it doesn't help us on an extended sickness which might occur next year. Better figure some way to get these days used up before th end of the year. So, when the Yankees or Red Sox are in town we get sick.

On the other side of this picture we see a company which through its administrative personnel feels that sick leave has a social benefit. Yet it doesn't want to give the advantages of being a supervisor or an executive to the ordinary worker. They have, therefore, developed a plan of a social advancement, the sick leave plan. This will protect the ordinary worker and will see that his job is kept for him.

Actually if a man is sick for more than a couple of days, or a week, then we must replace him for we can't be expected to hold a job for him very long, even if we do have a sick leave plan.

Further, the building up of credit days over the year must be wiped out each year or the company would be giving too much to the worker. This attitude of give and yet step down has created a feeling among workers in general that a sick leave plan is something to get while the getting is good.

However, fortunately for all concerned there are only a few workers who really feel that a company and

(Continued on page 256)

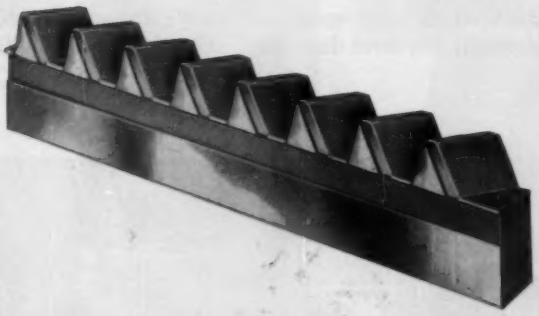
"Oh no, nothing like that. He's a field representative for the company."

Everybody knows that

National Tool Company

makes rotary herringbone

gear shaper cutters



But did you know we make

rack-type herringbone

gear shaper cutters

and more special cutting tools of all kinds

than any other tool manufacturer?

For more than half a century National Tool Company has supplied high quality precision cutting tools to the metal working industry. When your job requires special cutting tools call your National Tool representative. His assistance is yours for the asking whether you're interested in one *special* tool or a complete tooling program.

NATIONAL Tools CLEVELAND

National

TOOL CO.

Cleveland 2, Ohio

Representatives in major industrial centers

New FREE Catalog

To National Tool Co., 11200 Madison Ave., Cleveland, Ohio

Please send NEW 92 page catalog showing National Tool Company's complete line of *special* tools for the metal-working industry.

Name_____

Position_____

Company_____

Address_____

City_____ Zone_____ State_____

OVER TWENTY YEARS OF

Onsrud® innovation and

SPECIALLY DESIGNED FOR HIGH-SPEED ALUMINUM MILLING

● Everything Onsrud designs and builds . . . from machine tool components supplied to equipment builders to complete milling machines . . . everything from a 20 ounce high speed spindle to a 100 ton electronically controlled contour mill . . . is made for the specific purpose of milling ALUMINUM and related nonferrous metals. As you plan for new production or review your present methods and machines, if your objective is to find the means of *reducing costs*, be sure to let an Onsrud representative show you the ways Onsrud specialization can help you.

PROVED BY EXPERIENCE

● Onsrud has been a designer and supplier of production milling machines for the aircraft industry for over twenty years. Since 1945 Onsrud has developed a series of special high speed machines now in use in a variety of industries . . . all for the mass production milling of aluminum and other nonferrous metal parts.

Onsrud today has successfully developed and built special electronically controlled milling machines for hyper-speed face, profile and contour milling involving three dimensional and three directional infinitely variable milling feeds.

ELECTRONIC CONTROL SYSTEMS For control of speeds and feeds beyond the limits of mechanical systems and manual control . . . and extension of production milling machine application to parts impossible to machine before. Designed and built as Selsyn follower, analog and digital systems.

HIGH SPEED INDUCTION MOTORS Built in capacities from 1 to 150 HP, for spindle speeds from 3,600 to 20,000 RPM. Air or liquid cooled for greatest possible sustained and intermittent overloads.

PRACTICAL Through Onsrud Machine Components Like These

A wide variety of components are offered to manufacturers wishing to build their own special machines . . . components that are also employed in Onsrud designed and built milling machines. Typical components include:

INVOMIL® ROTARY MILLING HEAD One of the most unusual milling head assemblies in the machine tool field. Provides infinite rotary feed of milling head through 360°. When mounted on gantry type carriage, in combination with conventional transverse and longitudinal feeds, provides infinite feed of milling head through any point on table.

HYPER-SPEED SPINDLES Specially designed and built for the high rotational speeds of Onsrud motors. Assemblies equipped with preloaded bearings for precision end milling application. Dynamically balanced for vibration-free operation.

FAMOUS ONSRUD FIRSTS

- air turbine drives
- Metered Mist lubrication systems for high speed spindles
- water and air cooled high cycle induction drive motors
- InvOmil rotary feed milling head
- rotary table feed for automatic milling

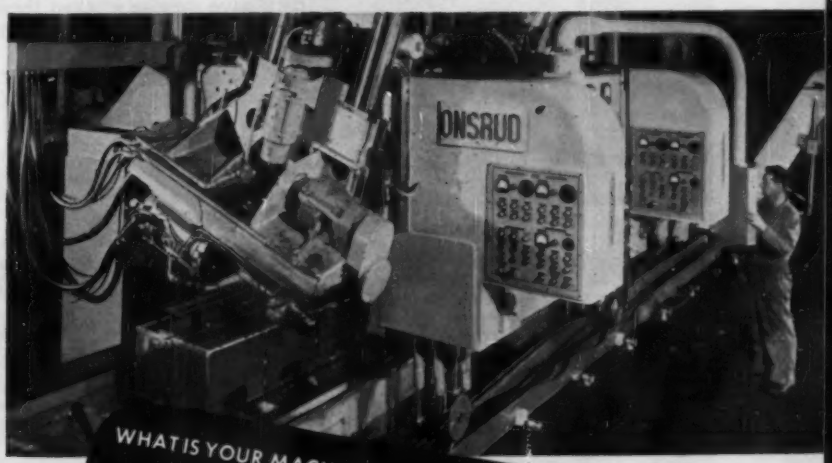
Onsrud. FOR

leadership to serve you...

When the parts to be milled are ALUMINUM Alloys or related nonferrous metals

TYPICAL ONSRUD MACHINES NOW USED IN PRODUCTION MILLING

Onsrud A90-36 Automatic Contour or Profile Milling Machine with electronic and electro-hydraulic tracer Selsyn control system. For milling aircraft spar beams and other structural members. Reduces machine time and expands application. A precision machine for high speed automatic production.



Onsrud A-242S Tri-Way Milling Machine. One vertical and two horizontal milling heads operate at one time to mill three sides of part.

Onsrud AA50-AE Rotary Feed Milling Machine, equipped with vertical head mounted on pivoted overarm. Follower on head assembly follows template as milling cutter reproduces template contour or line on work piece.

WHAT IS YOUR MACHINING TIME NOW ON PARTS LIKE THESE?

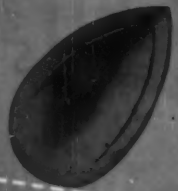
These parts are a few examples of the production time savings possible with Onsrud equipment.

Outboard Motor Housing, aluminum alloy casting, 7" wide x 13" long and 6" high. Machine three faces in one setup. Production...three complete parts per minute.

Double Section Skillet, aluminum alloy casting, 10½" square x 3" high. Three different setups to complete parts. Production per setup...three parts per minute.

Flat Griddle, aluminum alloy casting, 11" x 11½" x 9/16" high. Machine four sides and face of top rim in one setup. Production . . .two parts per minute.

Aluminum alloy carburetor part. Face mill two sides . . . production four parts per minute.



Steam iron sole plate, aluminum alloy. Face milling operation . . . six parts per minute.

Onsrud offers components, standard machines, and machines built to your production specifications . . . all for the super high speed production milling of aluminum and related metals. May we invite your inquiry for complete information?

ONSRUD MACHINE WORKS, INC.
MACHINE TOOL DIVISION
771 Lehigh Avenue
Niles 31, Illinois

DOING THINGS BETTER BY DOING THINGS DIFFERENTLY

WHEN THE BOTTOM DROPPED OUT of the ERIE CANAL

Of the many noteworthy events that took place back in 1907, one of the most unusual occurred near Syracuse New York, where a part of the bottom of the Erie Canal dropped out. Four canal boats were sucked through and shattered; a flour mill was badly damaged; and there was a loss of over $500,000. This catastrophe may sound more believable when we tell you that the break occurred on a viaduct over Onondaga Creek.

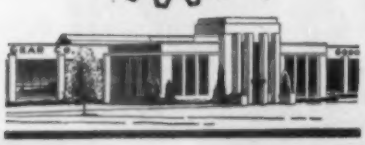
In a more constructive vein, a happier (if less publicized) event occurred in Cincinnati in the same year, when Soren Sorensen and John Christensen founded what was to become The Cincinnati Gear Company.

In the ensuing fifty years, many changes have taken place. People no longer ride on canal boats; and the gear-manufacturing business has progressed similarly. Technologically we've been in the forefront of this progress, but we've also tried to preserve some of the attention to detail and "craftsmanship" that prevailed in those earlier times. The result has been a gratifying record of customer satisfaction — the kind of satisfaction we'd like *you* to experience on your next custom gear order.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO

Fifty Years of "Gears—Good Gears Only"

CINTI®



the world in general owes them a living. That to work means drawing a big paycheck without expending a normal amount of labor. These people use all plans to their personal advantage. The sick leave plan is no exception. They are the ones who figure ways and means to get all the time used up before the end of the year. And they, too, are the ones who cry the loudest if after they have unwisely taken their sick leave, they really and truly do get sick.

Can we control this thing? Perhaps we should say can we stop social advancement and the fast movement toward socialism? Granted that we live better today than our forefathers; none of us wants to return to the pioneer days. Yet with this mad rush to easy living, some day we are going to see our country not the leader but a broken-down fourth-rate power. Remember history, and history repeats. Rome fell and so did Greece. Our children grow up in riches and get no adequate schooling. We have only "book" engineers because we lack grass-root training. We are living on borrowed time.

Sure the idea will work if one asked when are you going to be sick? It would do this for the sick leave—it would make it a second vacation. Perhaps a good idea. Why not make sick leave accumulated vacation time in the winter?

The idea Al has would not help him very much and would cause him many headaches since all employees would grab at the idea. Probably now only one or two take undue advantage of the plan. The solution is better plans for sick employees, not just another gimmick.

Charles D Townsend
West Hartford, Conn

"You must be the new man. . . ?"

NIGHT TIME'S FOR SLEEPING

Should the same shop rules be in force on the night shift as on the day shift? Can any more leniency be allowed, or should equal discipline be enforced for both?

There should be no difference in the discipline required of night shift from that demanded of day shift. Each is part of a whole and both are subject to the conditions of employment laid down by the company.

For many years I've been responsible, rather in absentia, for a night shift, and my conviction is that the most experienced, effective, reliable foremen should be in charge of night-shift work. I associate those qualities with shop discipline and with technical and practical skill, the reason being that night foremen don't enjoy the comforting presence of the higher management and technical staff as do the day-shift foremen. If a spanner gets into the wheels at night, say, in the matter of discipline or schedule, it is well if the night foreman is a resourceful fellow who can act on his own initiative.

I feel that Al's company is rather out of touch with modern thought and practice in the matter of shop discipline and working conditions. In progressive concerns it is now generally conceded that there is no point in compelling a man to stand on his feet if he can just as efficiently execute his work in a sitting posture. Fatigue is the nigger in the woodpile where accuracy and dextrous manipulation are called for. Production, quality, and quantity suffer in consequence. I have always regarded it as barbarous and short-sighted practice to compel an operator to stand all day on his feet when he might be comfortably seated, without injury to company interests. In the case of long cuts, if the man is comfortably seated at the controls and alert for any contingency, he can deal with an emergency as effectively as if he stood at his machine.

I believe the connection between fatigue and accident is a very real one. In the period between two world wars I was engaged on building heavy machine tools for shipbuilding yards. Machines for planing hull plates were a prominent feature. The carriage and toolbox of those planers were driven by a coarse pitch screw, 40 ft long, 5 in. in diameter. The lathe which machined those long screws had a seat mounted on the carriage so that the operator could sit and observe tool behavior while traveling along with it. In the shipbuilding yards those plate edge planing machines took a

McKay ROLLER LEVELERS

. . . From Tin Plate to Ship Plate

Tin cans and super-tankers have more in common than cargo space — the flat steel of which they're made had to be roller leveled. Regardless of the product — cans, cars, planes, appliances or ships — more fabricators will tell you that the "buy-word" in roller levelers is McKay. Write for Bulletin 100, or call for a McKay Application Engineer today.

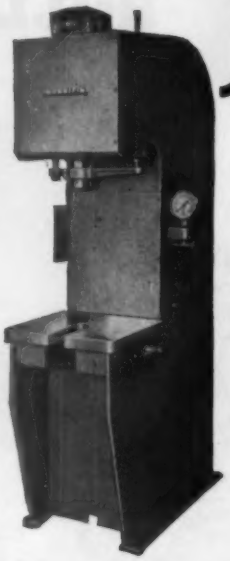
THE McKAY MACHINE COMPANY
Youngstown, Ohio

McK

SETTING THE STANDARDS OF QUALITY METAL WORKING MACHINES FOR TWO GENERATIONS

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES



1-TON, Bench Type	$ 605
2-TON, Bench Type	$ 680
5-TON, with Base	$1,530
8-TON, with Base	$1,605
10-TON, Floor Type	$2,290
25-TON, Floor Type	$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

Make accurate set-ups *faster* with this 25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost*.

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

Grind 90° to 140° Included Angle on *ALL DRILLS*, ⅛" to 2½"

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

McDONOUGH MFG. CO.

1526 GALLOWAY • EAU CLAIRE, WISC.

rough straightening cut along each longitudinal edge of the hull plates and, as builders, we fitted a seat to the machine carriage for the operator. He was thus located over the cutting tool.

I give these two examples because Al's operator was sitting on a box resting during a long cut which Ed estimates would probably take 20 minutes. If Ed's estimate is approximately correct, the general manager who spotted him would have been more profitably employed doing a little constructive thinking. The sight of the operator "resting" seems to have aroused his destructive instinct. As a general manager he is a misfit. Any first-year apprentice could have told him that it isn't the done thing for a top executive to give an operator a lay-off. That is a matter for the shop foreman and Personnel. The general manager can set them both aside if he disagrees with their findings, but not in public. A chat with the man's foreman would have put the big boss wise to the poverty of ideas, the lack of modern outlook obtaining in the shops where he was expected to set the example of wise leadership and reasonable toleration.

Standing on one's feet for 20 minutes watching a routine operation repeated and repeated, can be boring and wearing experience. Had this been explained to the chief, by the foreman in charge, he would probably have cooled down and sympathized with the victim of the company's lack of consideration.

Al's attitude derives from the "book;" his private opinion may coincide more nearly with Ed's in this matter. The operator seated on the machine carriage during long cuts is good business for the man and the company. If Al believes the "book" to be right in all circumstances, I disagree with him.

C D Mackinnon
Lanarkshire, Scotland

"Your work must be terribly dangerous. My first day here and I've treated you six times already."

They look like twins... but one is synchronous

Louis Allis "SYNCRO-*SPEDE*"* offers... for the first time... a synchronous motor in the same frame sizes as a standard induction motor

New from Louis Allis — *the most compact and efficient synchronous induction motor on the market* ... the revolutionary "Syncro-Spede." It's the *only* synchronous motor built in standard NEMA frames for comparable ratings in any enclosure.

The space-saving "Syncro-Spede" has no external excitation, wound rotating fields, collector rings or brushes—offers simplified control and low-cost operation. And it's virtually maintenance-free.

In performance, "Syncro-Spede" delivers and maintains exact synchronous speed within its rated capacity, regardless of load variations or voltage dips. When "Syncro-Spede" motors of several different ratings are powered by a single adjustable-frequency source, their acceleration, running speed, and deceleration can be synchronized.

"Syncro-Spede" is the low-cost answer to such demanding synchronous applications as *precise adjustable-frequency multi-motor systems*... high-frequency generator drives and constant-speed conveyor drives . . . precision timing and metering devices . . . recording instrument drives . . . any system requiring constant speeds from no-load to full-load.

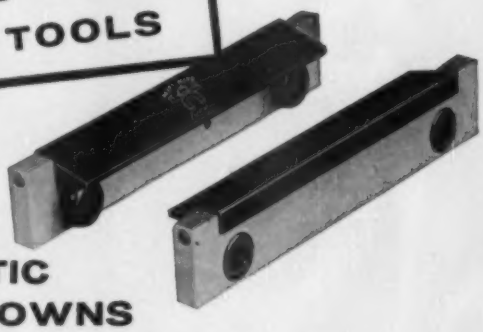
"Syncro-Spede" sizes range up to 100 hp. For information and expert application engineering assistance, contact your nearby Louis Allis District Office or write directly to The Louis Allis Company, 452 East Stewart Street, Milwaukee 1, Wisconsin.

*"Syncro-Spede" is a trademark of the Louis Allis Co.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

NEW
LUFKIN TOOLS



MAGNETIC
HOLD DOWNS

A new, time-saving idea in hold downs — faster, easier and more convenient. Attaches instantly and holds to vise jaws in any position without use of shims, blocks or parallels.

Clamping edge is 3/32", will hold very thin work. Backs are tapered, forcing the work downward as the vise jaws close. A flat spring tab keeps the hold down in a horizontal position until pressure is applied.

MAGNETIC BASE
HEAVY DUTY
Surface Gage

A large, rugged surface gage and indicator holder. Increased base size prevents rocking . . . larger, stronger magnets permit use with lug back and other heavy indicators and attachments.

The two heavy duty magnets recessed into the solid aluminum base are completely isolated from the spindle and other parts to avoid transmission of the magnetic pull. Polarity of the magnets is controlled by a king size on-off switch that turns the magnetic pull to full on . . . full off . . . or to any intermediate point to make minor adjustments in position. Ground and lapped, contact face has a V-groove, adapting it for use on cylindrical surfaces.

New design scriber has a removable, long-wearing carbide tip which can be reversed to protect the tip from damage when not in use.

Rugged, rocker arm and large diameter fine adjustment screw permit final, precise adjustments. 9" and 12" spindles, swivel indicator attachment, indicator holding rod, and scriber with reversible carbide tip are included. 18" spindle also available.

MITI-MITE
MAGNETIC BASE TOOLS
CATALOG

Send for this new 12 page illustrated catalog today. Contains full information on the complete Lufkin line of magnetic base tools.

BETTER MEASURE WITH LUFKIN
TAPES • RULES • PRECISION TOOLS
THE LUFKIN RULE COMPANY, Saginaw, Michigan 478

IT PAYS TO USE YOUR INDUSTRIAL DISTRIBUTOR
. . . He offers emergency 24 hour service

New Books . . .

PLASTIC TOOLING BIBLIOGRAPHY — *by Orville D Lascoe, professor of industrial engineering, Purdue University. Published by American Society of Tool Engineers, 10700 Puritan Ave, Detroit 38, Mich. 46 pages, paper bound. Price 75¢ to members, $1.50 nonmembers.*

As part of a plastic tooling research project, this bibliography contains 254 references and abstracts of every major writing concerning plastic tooling, since its inception. It is said to be the most extensive and complete bibliography yet compiled on the subject.

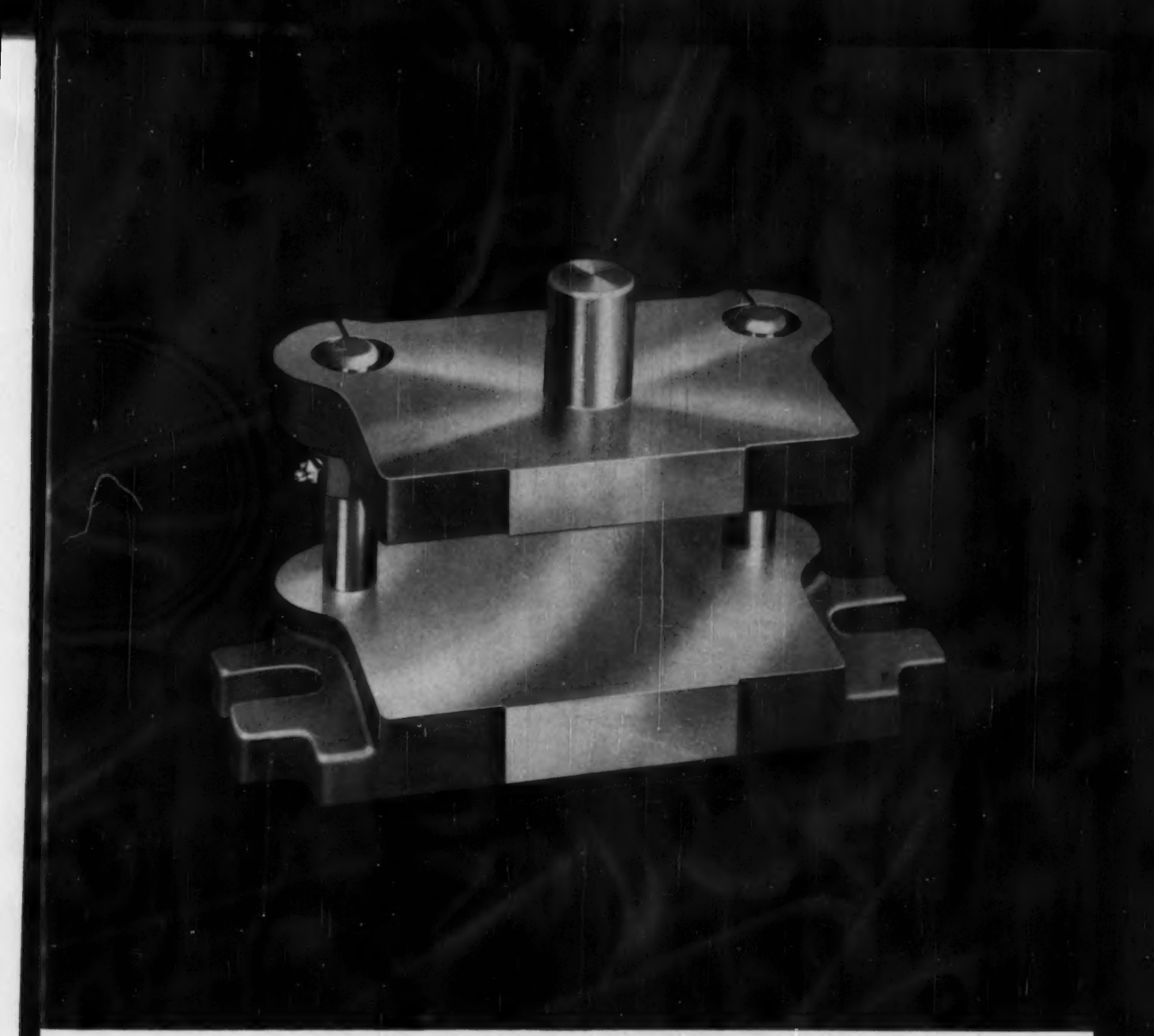
•

ELECTRONIC COMPONENTS HANDBOOK— *Edited by Keith Henney and Craig Walsh of McGraw-Hill Technical Writing Service for Electronic Components Laboratory, Wright Air Development Center. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, NY. 224 pages 9½ x 11. Price $9.00.*

This book was written primarily for the designer of military and commercial equipment. It contains data on capacitors, resistors, switches, and relays.

Because military equipment is called on to operate under extreme temperature, vibration, shock, and humidity conditions, it is evident that components used must conform to rigid government specifications. "Electronic Components Handbook" deals with the technique involved in performing environmental tests on components considered. But since military specifications are by no means the same from year to year, this may be the weak point of the book. To prevent the review from becoming obsolete, periodic revision would be necessary to conform with the latest changes in specifications. As an example of this, some part of environmental test procedure has already superseded the information given here. This is unfortunate but by no means impairs the excellent treatment of the subject matter in general.

Its application to the machinery field is somewhat limited, and to fully understand the significance of the tests and their resultant effect on electronic circuits, it will be necessary for the reader to have a cer-



THIS IS RIDICULOUS...

No one but a photographer ever saw a die set as shiny-bright as this one. If it's not being worked on in the tool room, usually it's buried away in a punch press, covered with oil and dirt, banging out piece after piece day after day.

And each one of those pieces is just like the others within a few thousandths of an inch. That's precision, the secret behind the success of mass production.

That's the reason for the die set's existence—to aid in maintaining precision just as long as possible. To do that, it has to be precision built.

Factory-assembled and factory-inspected, Detroit die sets meet the most important requirement of a die set, precision, in their parallelism, squareness and finish. High-quality materials plus more than ample size maintain that precision.

Over 2000 standard, stock die sets are detailed in Detroit Die Set's new catalog. Details on specials and accessories, too. Ask for it on company letterhead, or call your local representative.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

1 Page of Progress

from the NEW B. Jahn catalog!.....

Now available, the latest, revised edition of the B. Jahn Catalog. Scores of case histories show B. Jahn progressive die engineering and ingenuity solving mass production problems for America's most progressive manufacturers.

SEE how dies by B. Jahn end worry, wonder, waste! How B. Jahn can cure assembly headaches! How B. Jahn "Production Proved" Dies are built stronger, produce longer! How B. Jahn eliminated thousands of costly, unnecessary production operations and cut product costs! And more ! ! !

Send today for your copy of the NEW 20 page B. Jahn Catalog and learn for yourself how many of the world's largest manufacturers cut costs, improve product quality.

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

tain amount of formal training in the field. This is especially true since the book deals with the inherent characteristics of the components themselves, rather than an explanation of their functions in an electronic circuit.

New Films

RESEARCH—KEY TO PROGRESS. *Produced by Armour Research Foundation of Illinois Institute of Technology, 10 W 35th Street, Chicago 16, Ill. 16 mm, sound, color. Running time 15 min.*

Presented as a public service, this film traces the rise and contributions of research, particularly by independent research organizations such as Armour. The film is available for showing by colleges, professional societies, and civic organizations.

•

OVERWORKED AND UNDERPOWERED. *Produced by Compressed Air & Gas Institute, 1400 Terminal Tower, Cleveland, Ohio. 16 mm, sound, color. Running time 23 min.*

Purpose of this new film is to invite users of air power to examine their equipment with the idea of preventing power tools from being overworked and underpowered It shows how a correction of 5% faults in an air system can result in 95% savings in production efficiency. It points out common difficulties and shows how to correct them.

•

MACHINING STAINLESS STEELS. *Produced by Armco Steel Corp. Available from Jam Handy Organization, 2821 East Grand Blvd, Detroit 11, Mich. 16 mm, sound. Running time 30 min. No charge.*

Said to be the first film of its kind, this new picture shows how Armco developed free - machining steels that can be worked at high rates of production. Tool composition and proper use for different kinds of tools are demonstrated, and tool grind principles are outlined. Proper setups to insure rigidity and prevent vibration and shock to tools are also shown. The film is accompanied by a booklet providing a detailed description of the operations shown.

• Sharon has been a prime supplier of quality steels to the Garden Tool Industry for more than half a century. Our metallurgists and engineers have played important roles in the development of the special stainless steels, spring steels, cutting edge steels, forging steels and other quality specialty steels that have enabled the industry to constantly improve product quality.

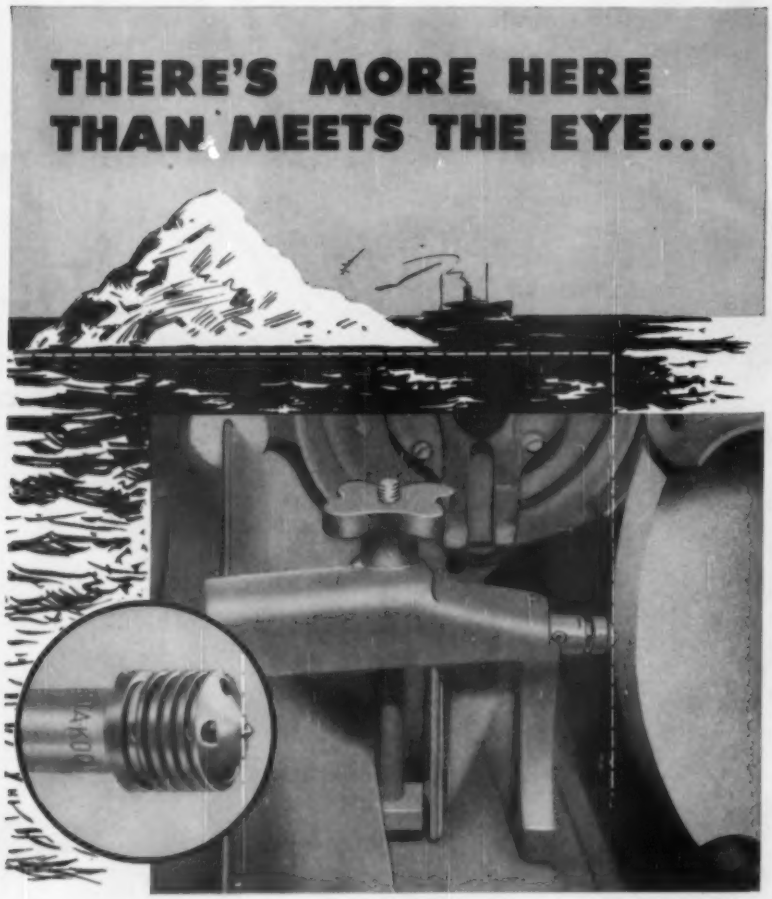
SHARONSTEEL

For 56 Years a Quality Nam in Steel

245

SHARON STEEL CORPORATION, SHARON, PENNA.

CHICAGO, CINCINNATI, CLEVELAND, DAYTON, DETROIT, GRAND RAPIDS, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, ROCHESTER, SAN FRANCISCO, SHARON, MONTREAL, TORON



In an iceberg or in a J. K. Smit Diamond Tool only a fraction shows above the surface.

Everyone knows about the unseen portion of an arctic iceberg. Many do not realize the unseen factors that lie beneath the surface of a J. K. Smit Diamond Tool, such as . . . our constant research to find still better methods of manufacturing Diamond Tools, the unquestioned integrity of our company since 1888, the manufacturing skills that have been learned and passed on through all those years, and quality control of manufacture for tool duplication.

All these hidden assets count much toward maintaining our position as a leader in the industry today.

When *your* next job specifies a diamond tool for any purpose contact J. K. Smit. Our field representatives are trained and qualified to assist you with any standard or special application.

J. K. SMIT & SONS, INC.
HOME OFFICE AND PLANT
MURRAY HILL NEW JERSEY

Names in the News . . .

Philip A Scheuble, Jr, has joined Vapor Heating Corp, Chicago, as general manager of the Vap-Air Division, manufacturer of temperature control equipment for aircraft. Mr Scheuble was formerly associated with A O Smith Corp in Milwaukee.

Joseph W Greene has been promoted from director of industrial sales for Crane Co, Chicago, to vice president, sales. **Charles W Lovelace,** manager of the valve and fitting department, succeeds Mr Greene.

L A DePolis, general sales manager of Clark Equipment Co's Industrial Truck Division, Battle Creek, Mich. has been appointed director of sales. **Bert E Phillips** has been promoted from assistant to sales manager.

James S Locke has been named manager of operations for Minneapolis-Honeywell Regulator Co's commercial division activities in Minneapolis. He was formerly divisional sales manager.

Ray M Ronald has been named domestic sales manager of Hyster Co's tractor equipment division. He was formerly western division sales manager at Portland, Ore. **Robert F Moody,** eastern division sales manager of industrial trucks at Danville, Ill, has been appointed domestic sales manager of these products.

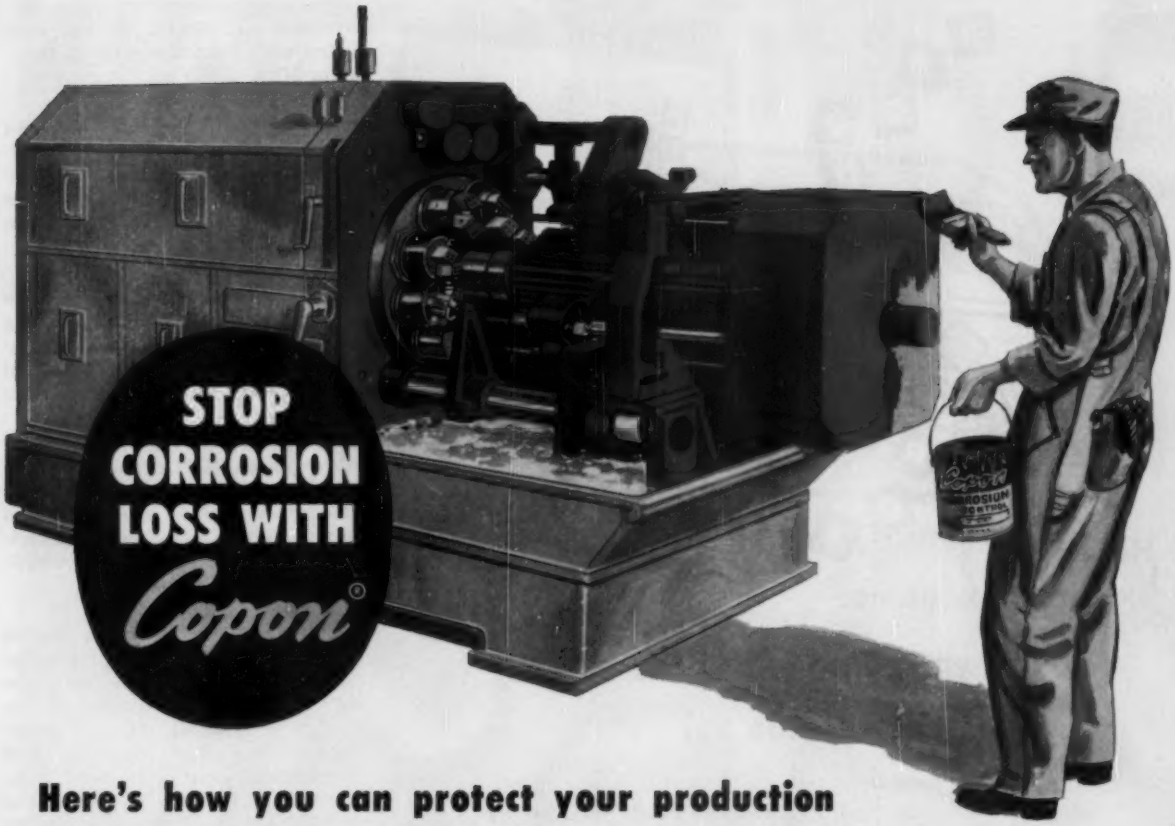
Allan B Fredhold, Jr, plant manager of General Logistics, Aeroquip Corp subsidiary in Pasadena, Calif, has been appointed general manager.

Arthur L Saull has been appointed factory manager of Gairing Tool Co, Detroit.

Robert W Hoefler has been promoted from sales engineer to assistant sales manager of Verson Allsteel Press Co, Chicago.

Hermann K Intemann, executive vice president of Electro Metallurgical Co, Division of Union Carbide Corp, has been appointed president of the company.

William L Wallace has been named assistant to the executive vice president of Alloy Precision Castings Co, Cleveland, Ohio. Prior to joining the



Here's how you can protect your production equipment from severe metal-cutting coolants

Now . . . a protective coating that will withstand even the stripping action of synthetic coolants. ACTIVATED COPON prevents corrosion damage to expensive machine tools . . . adds years of service life. Just three coats will provide long-lasting protection from constant spillage or complete immersion in coolant mixtures.

COPON coatings offer a ready solution to industry's most persistent corrosion problems. They adhere tenaciously to metal, wood, or concrete surfaces and provide outstanding protection against action of chemical fumes, chemical spillage, salt or fresh water and many other contaminating factors. Each coating is the result of extensive research and careful testing and has been designed to do a specific job.

A complete technical service is provided to assist you in selecting the COPON coating to solve your particular corrosion problem. Write today for details.

COPON is available in a wide variety of colors and may be easily applied by spray, brush, dip or roller coating methods.

Get complete information about COPON. Mail coupon to manufacturer located nearest to your city.

ALLIED PAINT MFG. COMPANY
P. O. Box 1088, Tulsa, Okla.

BENNETT'S,
65 W. First South St.,
Salt Lake City 10, Utah

WALTER N. BOYSEN CO.
42nd & Linden Sts., Oakland 8, Calif.
2309 E. 15th St., Los Angeles, Calif.

BRITISH AMERICA PAINT CO., LTD.
P. O. Box 70, Victoria, B. C., Canada

BROOKLYN PAINT & VARNISH CO., INC.
90 Jay Street, Brooklyn 1, N. Y.

COAST PAINT & LACQUER CO.
P. O. Box 1113, Houston 1, Texas

ENTERPRISE PAINT MANUFACTURING CO
3541 S. Ashland Ave., Chicago 8, Ill.

HANNA PAINT CO., INC.
P. O. Box 3206, S. H. Station,
Birmingham 5, Ala.

KOHLER-McLISTER PAINT CO.
P. O. Box 546, Denver 1, Colo.

McDOUGALL-BUTLER CO., INC.
2929 Main St., Buffalo 14, New York

JAMES B. SIPE and COMPANY, INC.
P. O. Box 8010, Pittsburgh 16, Pa.

MAIL COUPON TODAY

Please send me information about COPON Coatings for Corrosion Control.

Name_____

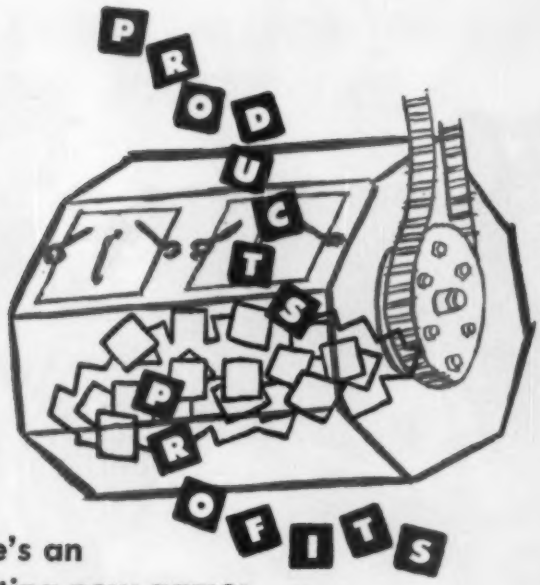
Company_____

Position_____

Address_____

City_____ State_____

AM-6



Here's an exciting new game:

PUT your products in the barrel TAKE your profits out

One of the greatest money-saving opportunities in metalworking lies in the use of barrels to finish parts by the hundreds in place of conventional methods that finish one part at a time.

Barrel finishing makes easy work of many tough jobs of grinding, deburring and buffing by wheel.

One Oakite customer changed to barrel methods to deburr curved stainless steel strips that are 14 inches long. The cost for deburring 20,000 strips was reduced from $3,000 to $125.00.

FREE For a copy of "*Precision Barrel Finishing*" —containing valuable information on cutting down, deburring, descaling, and burnishing—write to Oakite Products, Inc., 24 Rector Street, New York 6, N. Y.

OAKITE
SPECIALIZED INDUSTRIAL CLEANING
MATERIALS · METHODS · SERVICE
SCIENCE

Export Division
Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

company last March, he was associated with Ford Motor Co in Dearborn, Mich.

Warren Lind, former superintendent of assembly at International Business Machines' San Jose, Calif, plant (Data Processing Division), has been appointed manager of manufacturing.

Mel E Maurer has joined A B Dick Co, Chicago maker of duplicating equipment, as vice president, manufacturing. He was formerly president of the Flex-O-Tube Division of Meridan Corp.

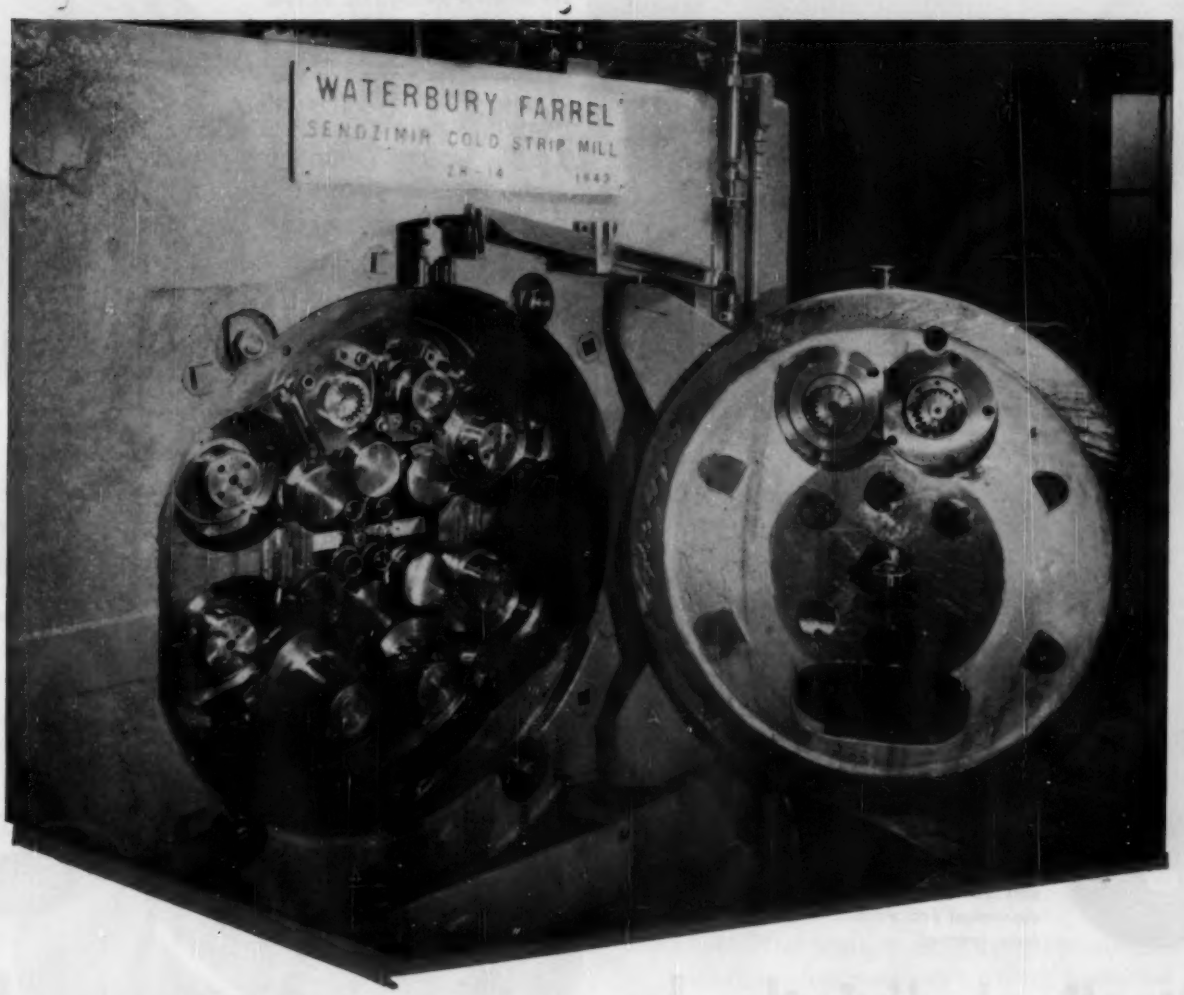
Avrel Mason, chief engineer of Cargill Detroit Corp, has been made general manager of a new division formed to handle engineering, manufacturing, and sales for all automatic gaging and size controls.

Willard B Paine has been elected executive vice president of Bendix-Westinghouse Automotive Air Brake Co, Elyria, Ohio. He succeeds the late **D S Kimball, Jr,** vice president and general manager. **I F Richardson,** assistant general manager of the Kansas City Division of Bendix Aviation Corp, succeeds Mr Paine as general manager. **Eldred E Evans,** director of the production management staff, takes over Mr Richardson's former duties.

Leonard N Goodell has been named manager of electrical products at the Sunnyvale Division of Westinghouse. He was formerly division manager of Bryant Electric Co, Bridgeport, Conn, subsidiary. Additional appointments: **Fenton L Tippett,** manager of manufacturing at Sunnyvale, to manager of mechanical products; **Kermit J Clark,** superintendent of electrical products manufacture, to manufacturing manager of that department; and **John J McAuliffe,** superintendent of mechanical products manufacture, to manager of the department.

Alvin J Dunn and **Gerald B Gits** have been appointed to head the new Pneumatics Division set up by Gits Bros Manufacturing Co, Chicago maker of lubrication devices and shaft seals.

Robert A Lebowitz has been appointed assistant to the manager of manufacturing at Polytechnic Research & Development Co, Brooklyn, NY, manufacturer of electronic test instruments and components.



Why Bearings, Inc. engineers were asked to solve this bearing problem

FACT—This cold strip mill performs a 70% reduction on light gauge silicon steel. The bearings needed for this job must carry heavy loads. Yet, they must be precise to help insure continuous production of strip without gauge variation from end to end of the coil.

FACT—The plant in which this mill was installed called a Bearings, Inc. engineer who, after a thorough study of the equipment and its uses, recommended the correct replacement bearing for the application. The user knew, from past experience, that Bearings, Inc. engineers had full knowledge of all types of bearings and could recommend the best from the many lines Bearings, Inc. distributes.

FACT—When the O.D. of these bearings become indented by fragments or roll flattened from extended service, we have them ground in shaft sets to within .0002″ section height . . . a further service of Bearings, Inc. and the manufacturer of the bearings.

This is the bearing service and follow through you can expect from Bearings, Inc., your authorized distributor for all nationally known makes of bearings. This is why we are called by our customers for any bearing problem. We'd appreciate the opportunity of helping *you!* Call or write NOW!

Providing bearing service in the territories adjacent to our branches, listed below.

BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute
PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Wheeling
NEW JERSEY: Camden • **MARYLAND:** Baltimore
DELAWARE: Wilmington •
Subsidiaries: Balanrol Corp. • Buffalo, N.Y.•
Kentucky Ball and Roller Bearing Co. • Louisville, Ky.

The success of Sterling's No. 2 Chuck and Segments on surfacing operations is indicative of the superior performance you may expect from all types of Sterling's "Wheels of Industry."

"Wheels of Industry"—Vitrified and Resinoid—provide the best economical and efficient method of metal removal.

Sterling's "sixth element" grinding wheels provide assurance of positive job results

STERLING EMPLOYS a new element in its "Wheels of Industry." Added to the usual group of five—abrasive, grain size, grade, structure, bond—is a new *sixth element*—the *human* element. Thus, Sterling offers an important "extra" that makes its wheels better.

The sixth element is based upon the reactions of the operator to the varying demands of his job—how the strength or ease with which he applies the work to the wheel affects grinding efficiency and thereby changes wheel specifications. How his preferences can be met by building a special wheel—that's the *sixth element* in action . . . the *human* element that results in every Sterling grinding unit being tailor-made whenever necessary.

Unusual study of the *sixth element* is an everyday assignment for Sterling abrasive engineers or representatives of our well-stocked distributors. The addition of the *human* element to Sterling's "Wheels of Industry" slows down costs, speeds up production. This successful application of the *sixth element* needs only a meeting of minds—yours and ours. No obligation, of course. Write, wire, or phone us today.

STERLING GRINDING WHEELS

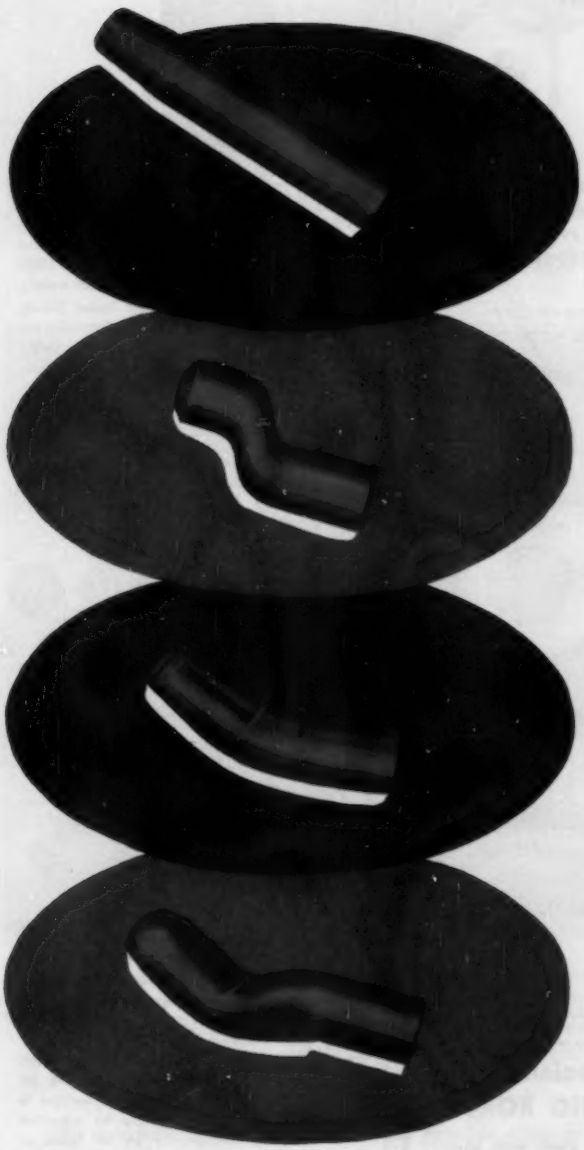
"THE WHEELS OF INDUSTRY" STERLING

STERLING GRINDING WHEEL CO., TIFFIN, OHIO—SUBSIDIARY OF ABRASIVE AND METAL PRODUCTS COMPANY

Distributors and Direct Representatives Located in All Principal Cities

If You Use Resistance Welding...

Take A Tip From Mallory



Mallory resistance welding electrodes are available in the widest variety of stock sizes and shapes to be found anywhere. Many of the Mallory standards can actually eliminate the need for costly special electrodes. Constant Mallory research and pioneer background in the field of alloys continues to contribute increased life and better performance to a growing number of diversified users.

FAST DELIVERY is a product of a large and well rounded stock of standard electrodes. Mallory's diversified stock enables changeover and replacement units to be shipped to you on short notice.

LOWER COSTS are your benefit—brought about by the broad line of standard electrodes which often eliminate custom-built costs; and by Mallory's continuous effort to increase life and improve performance.

VERSATILITY of Mallory stock designs minimizes down time when machines are being converted to another service. Mallory's precision manufacturing holds dimensions to close tolerances, assuring complete interchangeability.

UNIFORM HIGH QUALITY of Mallory standard electrodes gives you performance dependability. You can count on Mallory for correct tapers, water tight connections, and smooth, symmetrical point forms. Every Mallory electrode is 100% inspected to insure consistently uniform, dependable service.

Write for your complete resistance welding catalog —*NOW*.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd.
110 Industry Street, Toronto 15, Ontario

Serving Industry with These Products:

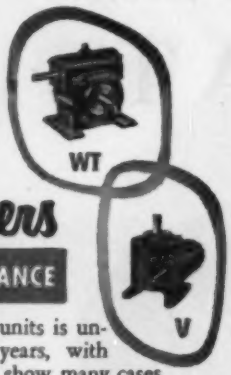
Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

Expect more... get more from

P R MALLORY & CO Inc
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

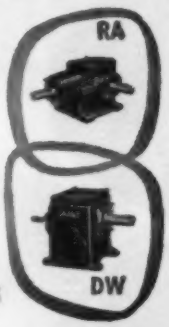
Grant Speed Reducers



YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.



Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

STOCK GEARS SPECIAL GEARS

SPEED REDUCERS

GRANT GEAR WORKS INC.

Founded in 1872 by George B. Grant, the Pioneer Gear Man

[illegible] STREET BOSTON [illegible]

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly pig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work? Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs*. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

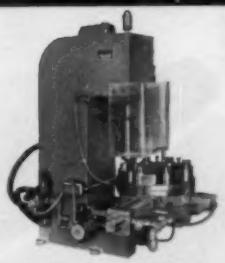
Complete details sent promptly on request

LINLEY BROTHERS CO.

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

AIR-HYDRAULICS INCORPORATED

INCREASE PRODUCTION 50%



IT'S BEEN DONE—for a "big 3" auto company. Tooling shown increased production on press assembly of steering knuckles from 1200 to 1800 pieces per hour—with added operator safety. **COMPLETE SET-UP**—#1405 Air Index Table, #C-300 5½ Ton Press, controls and fixtures were furnished by Air-Hydraulics, Inc. An electrical circuit synchronizes press and table for fully automatic operation on standard line pressures. Operator places pieces on fixture outside guard • Parts are indexed into position and pressed together • Assembly is removed automatically and chuted into container. Constant pressure throughout ram stroke has eliminated previous trouble caused by variations in stock thickness and other factors.

AIR-HYDRAULICS INCORPORATED

HEAVY DUTY air INDEX TABLE

NO BACKLASH, SKIPS, OVERRUNS

THE REASONS are simple but important: • Positive index, because the index pin shifts to the new position while table is stationary and is only disengaged by locking dog after indexing • Locking cylinder insures firm seating of dog in ring notch • Cushion stop eliminates wracking jar • Two versatile sizes • Table surface is ground for accuracy • May be mounted vertically or horizontally on all types of presses or other tools where accuracy of register is imperative • Operates on line pressure from 60-175 lbs.

OUR 8 PAGE CATALOG covering presses, hammers, index tables and allied equipment is ready for you now. Write for yours today.

AIR-HYDRAULICS INCORPORATED

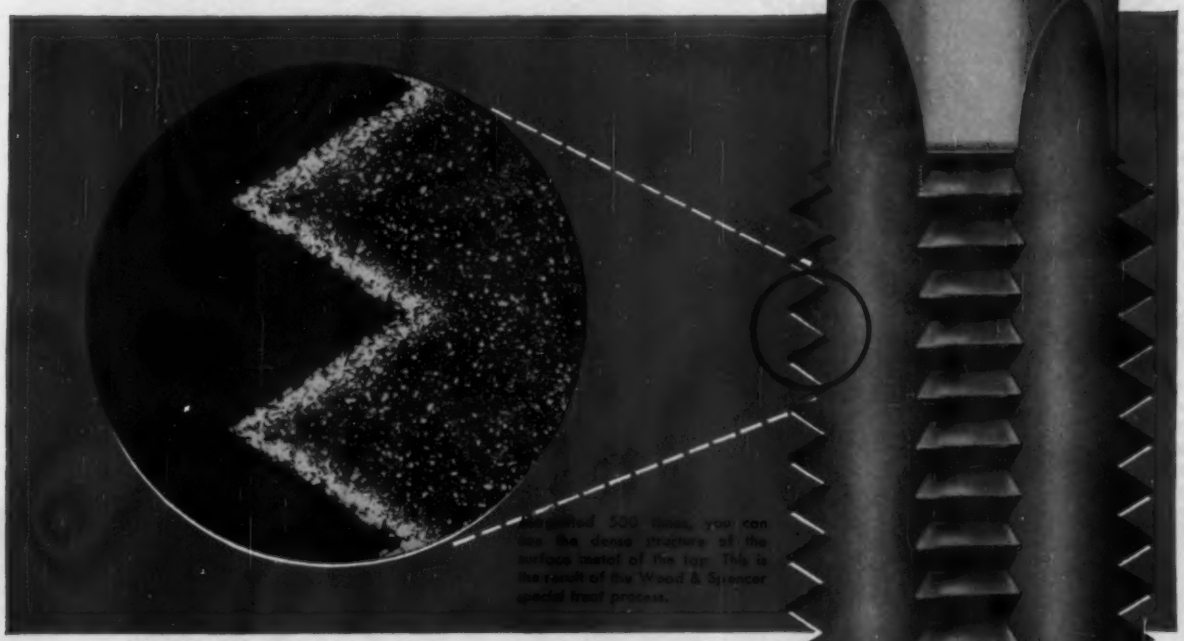
202 HUPP AVENUE
JACKSON, MICHIGAN

Wood & Spencer

STANDARD **TAPS** SPECIAL

...offer extra Surface Hardness

to preserve cutting accuracy



Magnified 500 times, you can see the dense structure of the surface metal of the tap. This is the result of the Wood & Spencer special treat process.

Beyond the standard heat-treating process is a *special treat* we use on some taps, to give them even more resistance to wear. This additional process imparts an extra surface hardness. The added wear resistance results in a tool which will endure especially demanding production runs . . . and retain threading accuracy throughout.

We recommend these taps mostly for *problem alloys* or for grueling production runs . . . although you may want them for other applications.

We call this additional treating process by the unglamorous name *"special treat."* That's what you ask for when you order. Why not try these extra long-wearing, *special treat* taps? We'll be glad to supply your needs.

Want a free tap guide: Everyone who has one finds this handy wall chart an excellent ready-reference. It tells all standard gage tolerances, class fits and tap tolerances. Write us for one on your business letterhead.

The Wood & Spencer Company • Cleveland 3, Ohio

For the man with a carbide problem and a ceramic future

The production man who teams carbides with worn, obsolete equipment is a glutton for punishment. He's working with a monkey wrench that throttles production and breaks tools.

Carbides won't work with machinery that lacks power, speed and rigidity. And ceramic tools, with their vast production promise for the future, are even more particular about the company they keep. They demand even higher speeds . . . closer tolerances . . . vibration-free equipment.

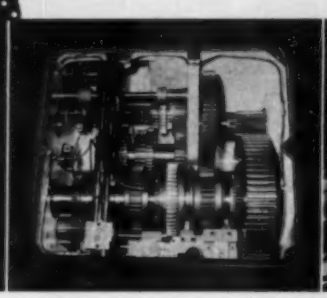
Axelson's new 4025 Heavy-Duty Lathe handles heavy cuts with accuracy that minimizes metal removal in ensuing operations. It thrives on big, healthy bites or small, precision cuts.

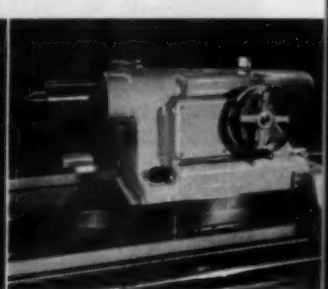
The 24-speed headstock delivers 75 h.p. (up to 100 h.p. for peak loads) throughout spindle speeds that range from 6 to 750 r.p.m. in true geometric progression.

The 4025 Heavy-Duty Lathe has a massive main bed casting to subdue the forces of heavy turning. The carriage bed ways are hardened and ground alloy steel.

Just two levers control a choice of 81 feeds, all contained in a totally enclosed gear box. Axelson's oil-tight, box-type apron runs shafts and gears in a continuous oil bath. All carriage controls are on the apron, right at hand level. The tailstock on Model 4025 is a sturdy, one-piece casting.

Axelson's 4025 Heavy-Duty Lathe is packed with the power, speed and rigidity you need . . . for today's carbides, for the ceramics of tomorrow. Put it to work on your team. Write for Bulletin A6-5504.





HEAD FULL OF POWER
. . . for carbides and ceramics. Twenty-four speeds. Up to 100 h.p. for peak loads.

BUILT TO TAKE IT
Sturdy one-piece casting. Two speeds for rapid or slow powerful movement.

AXELSON® LATHES

AXELSON MANUFACTURING COMPANY

Division of U. S. Industries, Inc.
6160 S. Boyle Avenue, Los Angeles 58, California

15,600 operations per hour, with

33 Station Automatic Transfer For Automobile Cylinder Heads by BAUSH

Completely automatic — this 33 station transfer line is 90 feet long, and is built up with all self-contained units . . .

- 8 Horizontal "S" Mechanical Lead Screw Units
- 6 Vertical Angular "S" Mechanical Lead Screw Units
- 4 Inverted Angular Mechanical Lead Screw Units
- 4 Horizontal "M" Mechanical Lead Screw Units
- 8 Vertical Angular Hydraulic Units
- 2 Probe and Blow-out Stations
- 2 Checking Units
- 3 Indexing Fixtures

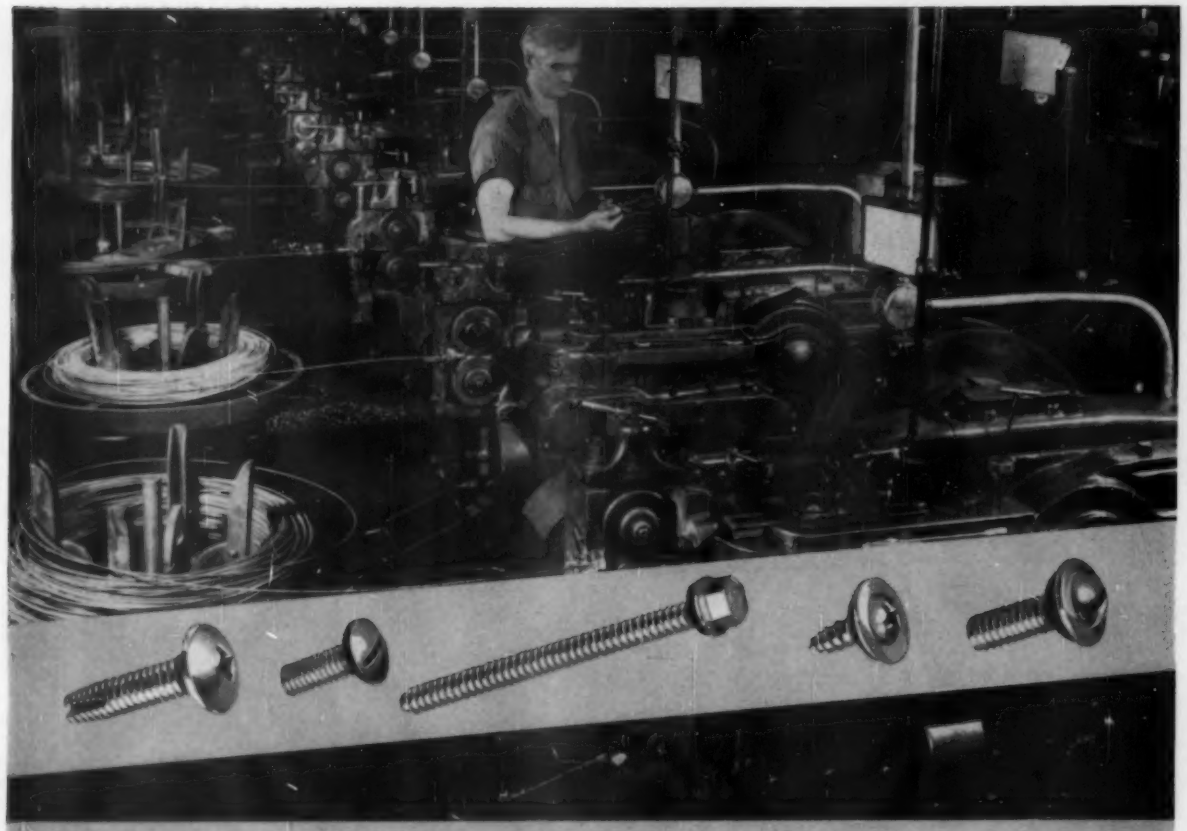
All clamping and unclamping operations done hydraulically.

Tool changing and maintenance have ample room between units. Moving parts automatically lubricated. Detector system throughout transfer and all electrical controls are J.I.C. Standards.

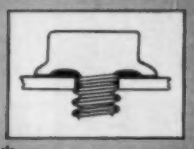
OPERATIONS: 156 cutting operations completed on 100 Cylinder Heads per hour — drill, ream, chamfer, spotface, mill pads and end mill.

Again the automotive industry looks to BAUSH for efficient automation. We're sure we can help YOU TOO — WHY NOT TRY US?

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS



Townsend Cold-Forges New *Tuff-Tite** Line On National Headers



* Neoprene washer trapped under head of TUFF-TITE fastener seals hole—acts as cushion.

Townsend Company, New Brighton, Pennsylvania, 141-year-old manufacturer of rivets and fasteners, has been relying upon National Headers to cold-forge most of its output for the past 26 years.

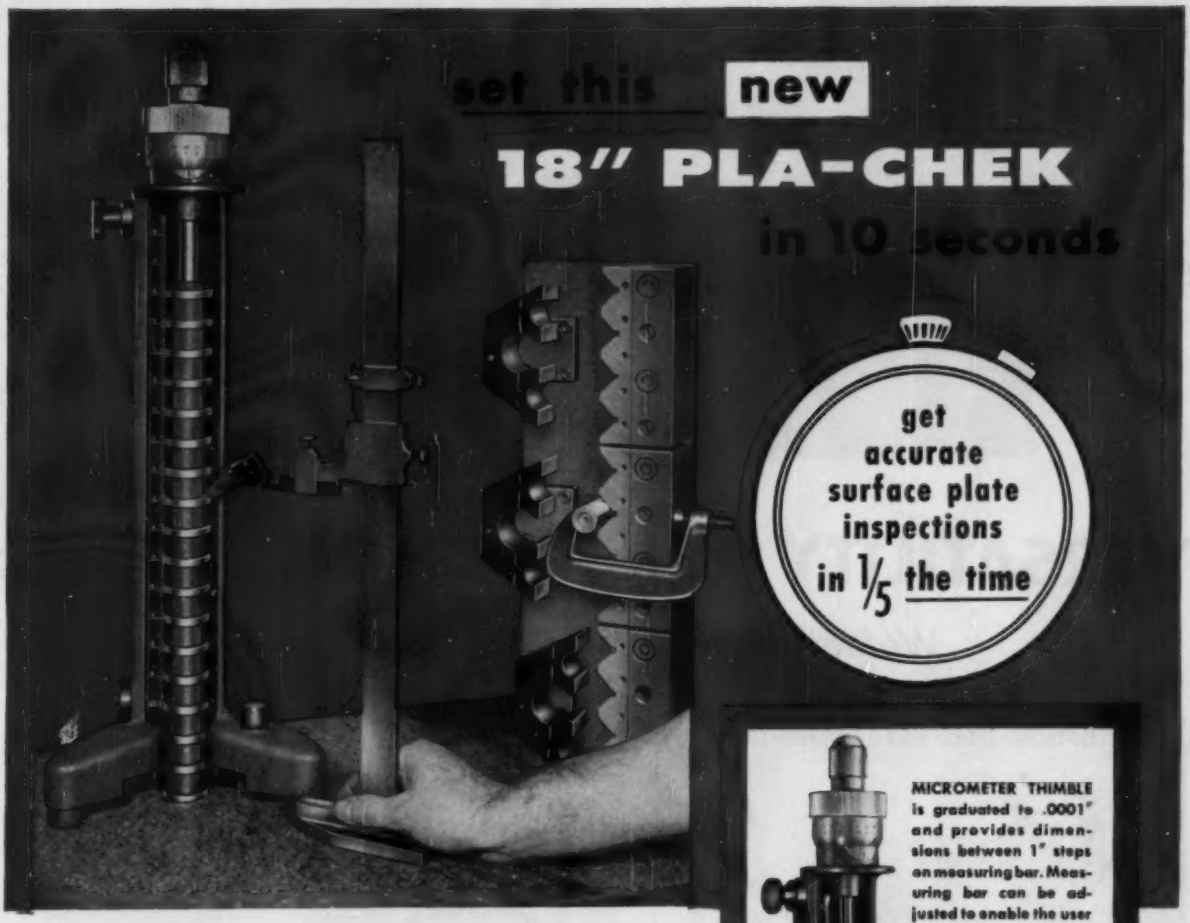
Townsend continually applies its vast experience to the up-to-the-minute fastener requirements of its customers. The company's operating people find the rigidity, ruggedness and overall ability of National Headers particularly valuable in cold-forging *by the millions* Townsend's new line of TUFF-TITE leakproof fasteners.

If *you* need to make metal parts faster, stronger and at lower cost, may we work with you? Send us your prints and samples, or better yet, accept our invitation to come to our plant. *Here we can approach tomorrow's new and better ways of forging metal parts in the light of methods and ideas which our people are already developing and testing today!*

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago



MICROMETER THIMBLE is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

accurate to .00005" throughout the 18" range

That's right! Just 10 seconds to set this NEW 18" PLA-CHEK GAGE . . . and you are ready to start your inspections. In hundreds of installations on innumerable jobs PLA-CHEK GAGES are daily proving their time-saving and money-saving advantages. Extremely easy to operate—no auxiliary gage blocks are necessary—this PLA-CHEK 18" model guarantees accuracy to fifty millionths through its entire range. The measuring bar is made of deep-frozen, strain-free alloy steel. Because it is of one-piece construction the steps cannot change or separate with age. Since it is not necessary to touch the measuring bar, body heat does not affect it. Return the coupon or write TODAY for literature and complete details.

Cadillac PLA-CHEK GAGES are available in a complete range of sizes: 6", 12", 18", 24", 36", and 48" models. Precision-made risers, increasing the range of each model, are also available.

Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

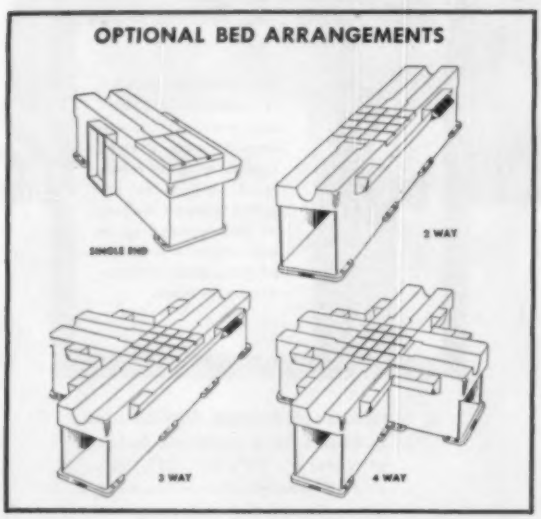
Address_____

City_____ Zone____ State_____

Photos courtesy of Simplex Machine Tool Corporation, Milwaukee, Wisconsin.

VERSATILITY FOR MACHINE TOOLS

Welded design does it at less cost



These precision boring machines can have one to four boring heads. The beds may vary in length . . . depending on the customers' needs. Such versatility in design and manufacture is made possible with welded steel . . . because:

- **A welded base design can be easily and quickly modified since there are no patterns involved.**
- **Less material is needed since steel is three times stronger than iron, 2½ times as rigid . . . yet costs a third as much per pound.**
- **Less machining, less finishing is needed.**

Basic advantages like these can be applied to many products. A Lincoln engineer who is backed by 45 years of Lincoln cost-cutting experience, will gladly show you how to benefit.

Write for Weldesign Bulletin, available to product designers.

THE LINCOLN ELECTRIC COMPANY

Dept. 2020, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

When steel is three times stronger than iron

Has much more versatility

Yet costs much less

WHY aren't your products designed for welded steel?

Jacobs
CHUCKS

Superior performance is the result of the painstaking production of superior parts.

Jacobs and your industrial supply distributor deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

The Jacobs Manufacturing Company
West Hartford, Connecticut

The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.

The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

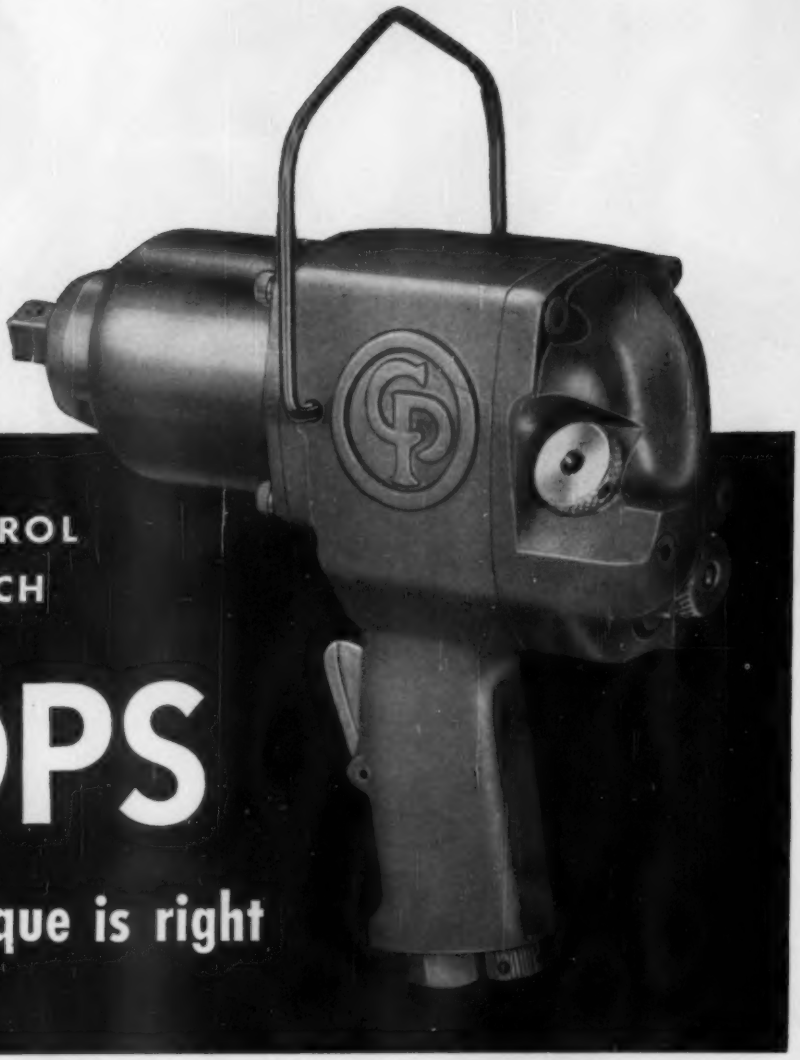
The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig-borers.

The Jacobs Rubber-Flex® Tap Chuck designed for tapping heads and impact tools.

The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.

The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.

NEW



TORQUE CONTROL IMPACT WRENCH

STOPS

when the torque is right

Ideal for production line work! The CP-3440-RTS Reversible Air Impact Wrench gives you faster "run downs" to the *exact* tightness—then *automatically* cuts out. It completely eliminates "over torque". Torque control is simple to set on the job, requires no tools or jigs. Adjustment remains constant until change is desired. For detailed information write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

TORQUE SELECTOR permits full-speed run-down to desired tightness without limiting impact action or cutting production rates.

AIR RESTRICTION VALVE sets up secondary torque adjustment ranges for lighter work.

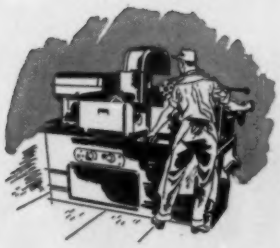
RANGE OF TORQUE ADJUSTMENT—12 to 80 foot pounds.

SHORT OVER-ALL LENGTH—only 7½"—permits close-quarter work; weighs 6⅞ pounds.

CAPACITY: ⅜" bolt size—heavy duty.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



"TRUKUT® increased production 4 times..."

A small Mid-Western machine shop was confronted with an economic problem – production costs were too high – tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

"I recommended Sinclair TRUKUT® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With TRUKUT, *production has been increased four times.* Four hundred or more pieces are produced before tool is replaced. Also – finish of threads is finer, and general appearance of the finished piece is better."

"The shop found TRUKUT EP, Grade C, so satisfactory that it now uses TRUKUT exclusively."

If *you* have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair TRUKUT EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

DINO, the Sinclair Dinosaur, says:

SINCLAIR

CUTTING OILS and COOLANTS

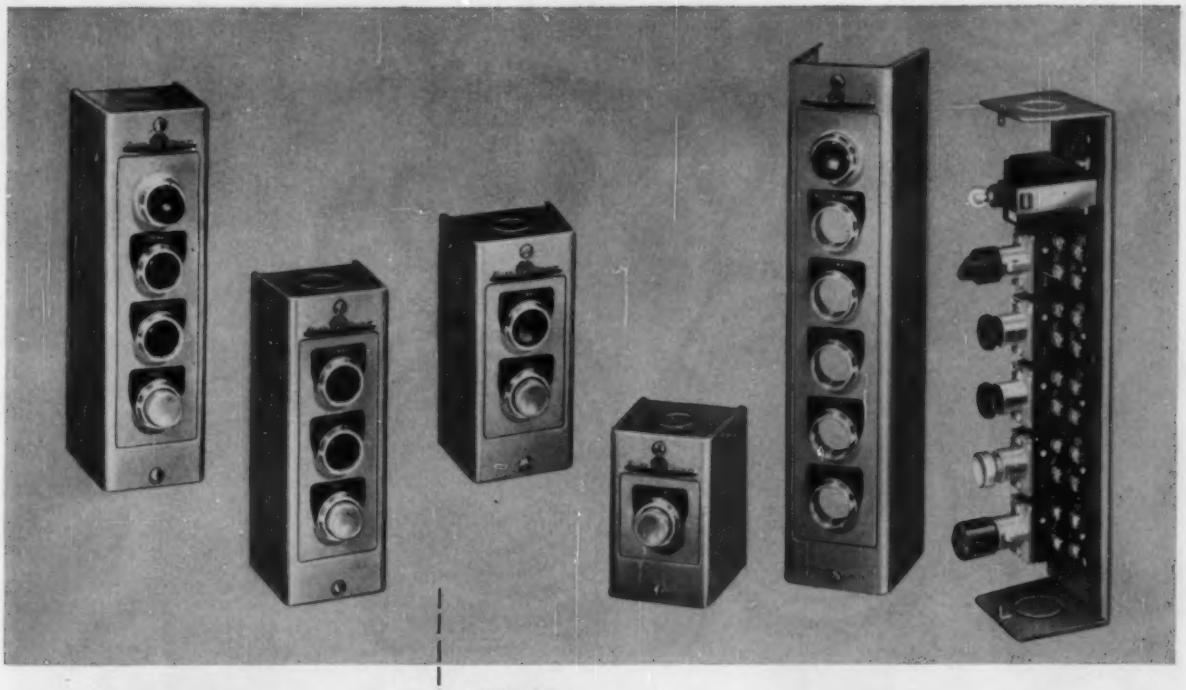
A new MODERN process...

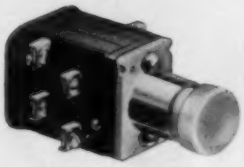
Automatic Control of Bonding Production

Shown here are Models No. 4CBS and 20CBR for bonding linings to metal cones of automatic transmissions. Custom-tailored fixtures adapt the machines to other automotive, aircraft, electrical and industrial applications.

MODERN'S Positive-Control bonding machines give you peak control efficiency over all prime factors—time, temperature and pressure. Lets you tailor output to needs. An adhesive curing process that can be used for bonding any two parent bodies together with adhesive agents. The machines range from fixed single-station to rotary forty-station types and automatically control the variables of bonding to any desired degree of absolute control. For full details, write for our new Bulletin CB-1.

MODERN®
Industrial Engineering Co.
14230 BIRWOOD AVE., DETROIT 38, MICHIGAN





Various types of operators are available, such as standard head, mushroom head, coin slot, key type, wing lever, and 2 or 3-position selector switches. Buttons can be had in a variety of colors.

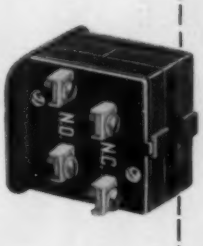
New HEAVY-DUTY PUSH BUTTONS

These new Bulletin 800 heavy-duty push buttons are the modernized version of the old, reliable line of Allen-Bradley heavy-duty stations. Advantages which . . . until now . . . have been restricted to oiltight stations used for machine tool service . . . have all been built into these new, heavy-duty stations . . . and *you* benefit from the result.

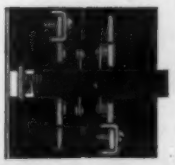
For instance, each button, selector switch, or pilot light is a self-contained unit which can be mounted singly or in groups—vertically or horizontally—in a variety of standard Allen-Bradley enclosures, or any other enclosure arranged for these units. The name plate reading will always be in the right direction. Double break, silver alloy contacts are used throughout.

No matter how special the station may be, it can be assembled on the job from a small stock of standard units. Standard enclosures accommodate up to 8 units. Enclosures for more than 8 units can be supplied on special order.

Please write for descriptive Bulletin 800.



External view of the contact block, showing the normally open and normally closed contact terminals.



Internal view of contact block, showing stationary, double break N.O. and N.C. contacts. The push rod carries the moving contacts.

A-B Quality

THE SIGN OF QUALITY MOTOR CONTROL

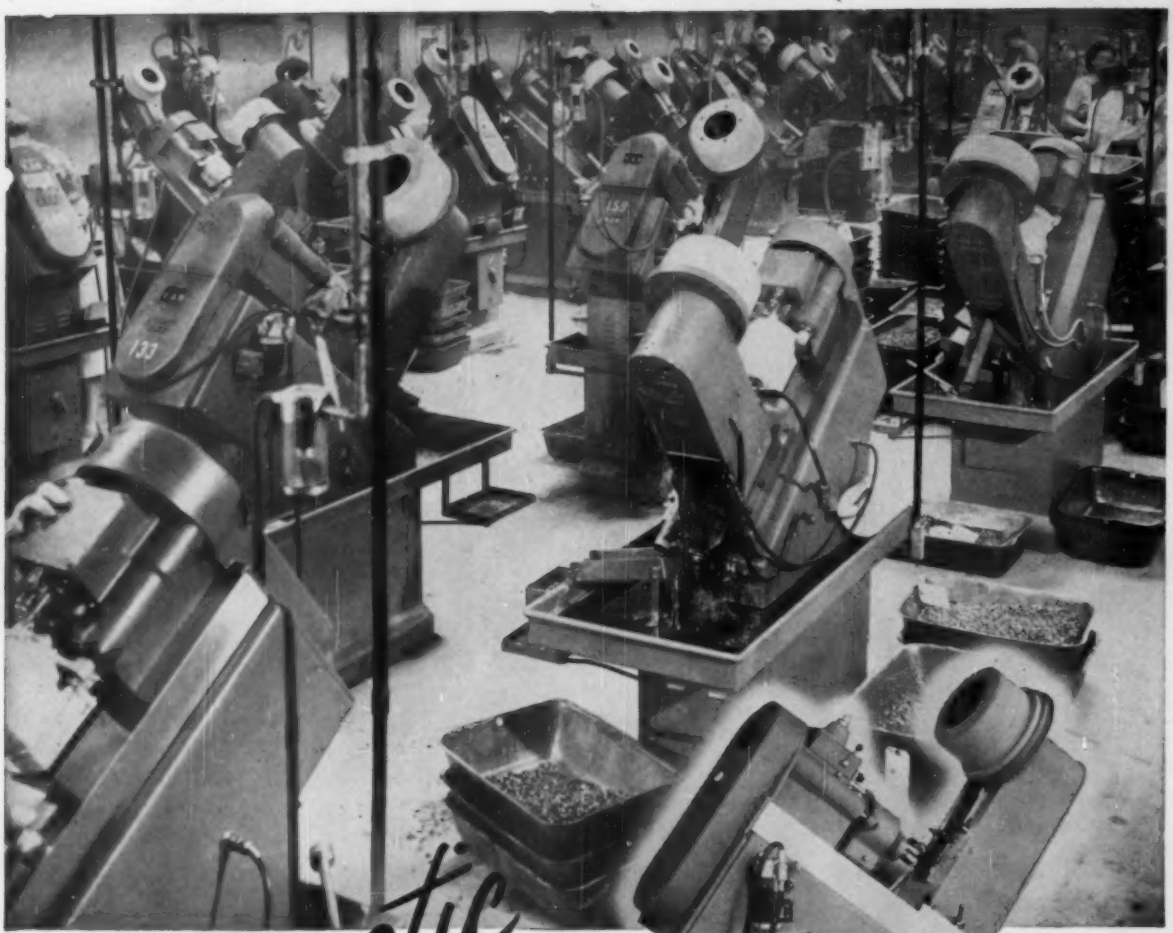
Allen-Bradley Co.
1310 S. First St.
Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

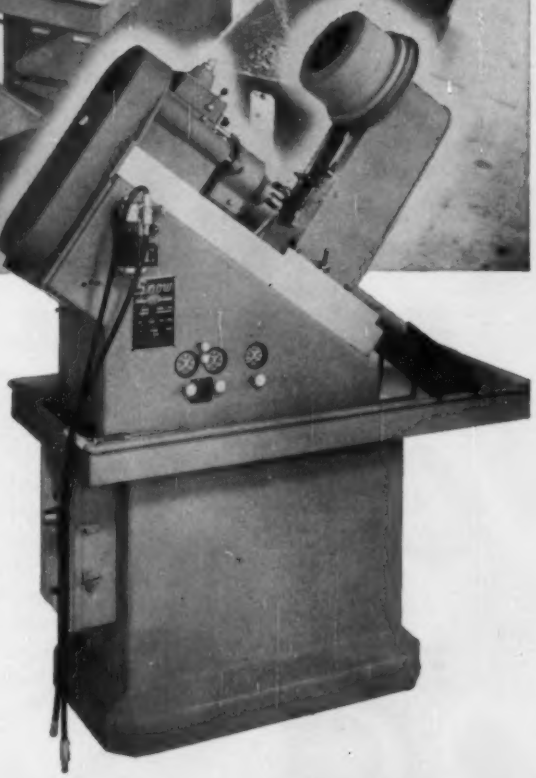
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY



Automatic NUT TAPPING MACHINES



This installation *at Shakeproof, Division of Illinois Tool Works, Elgin, Illinois,* is an illustration of productivity—*with precision.*

Simplicity of set-up and lower operational costs can make your Nut Tapping Department one of the most efficient and profitable in your plant. Submit samples and prints for a comparison with your present method.

VERTICAL DRILLING MACHINES
VERTICAL TAPPING MACHINES
VERTICAL THREADING MACHINES
TWO SPINDLE MACHINES
ANGULAR MACHINES
NUT TAPPING MACHINES
HORIZONTAL MACHINES
DRILLING AND TAPPING UNITS
AUTOMATIC JIGS AND FIXTURES
DRILL PRESS TAP HEADS

SNOW

MANUFACTURING COMPANY

435 EASTERN AVENUE, BELLWOOD, ILL.

(Suburb of Chicago)

NOW...AN ANSWER TO SUMMER RANCIDITY!

Anaerobic bacteria are ready for their annual *summer feast!* Their favorite dish—water-mix cutting and grinding fluids, and their calling card is rancidity. They cost you plenty in the past, by destroying the stability of soluble oil long before the end of normal service life.

But here's a way to put an end to this familiar machine shop free-loader! Just switch to a Stuart Heavy-Duty Water-Mix cutting and grinding fluid with *anaerobic bacteria inhibitor.* Solvol "X," Codol "X," Dasco Super Soluble "X" Base, and the new Dasco D-20 all contain "ABI," and are *guaranteed to stay sweet longer and retain their stability—even in hot weather and through long shutdowns when these bacteria multiply faster!*

GUARANTEED LONGER SERVICE LIFE!

"ABI" in Stuart's water-mix cutting and grinding fluids has been tested and approved by research scientists. Extensive on-the-job use proves it inhibits the growth of anaerobic bacteria because these four Stuart water mixtures last *three to four times longer* than other water mixtures. You are invited to try them on a 100 per cent money-back basis. Don't waste your plant's hard-earned dollars fattening anaerobes *this* summer—ask your Stuart Service Center to recommend the Stuart water-mix cutting and grinding fluid best suited to your operations.

Phone your Stuart Service Center

Arrange now to test Stuart's water-mix cutting and grinding fluids on your difficult machining jobs.

DETROIT, MICH.....Tyler 7-8500
CHICAGO, ILL.....Bishop 7-7100
HARTFORD, CONN.....Jackson 7-1144
CLEVELAND, OHIO.....Prospect 1-7411
PHILADELPHIA, PA.....Devonshire 8-6100
TORONTO, CANADA.....Oxford 9-9397

Representatives in all principal cities

SOLVOL "X" • DASCO D-20 • CODOL "X"
DASCO SUPER SOLUBLE "X" BASE

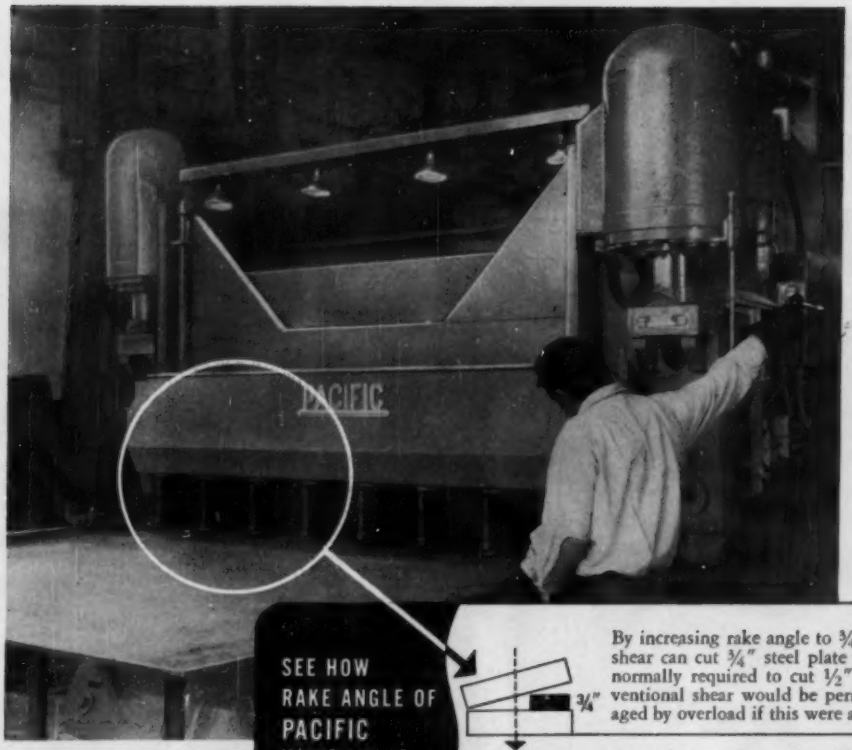
Since 1865
D. A. STUART OIL CO., LIMITED
2727 South Troy Street, Chicago 23, Illinois
CANADIAN D. A. STUART OIL CO., LIMITED
3575 Danforth Avenue, Toronto 13, Ontario

METALWORKING LUBRICANTS

1951 PARIS
1952 HANNOVER
1953 BRUXELLES
1954 MILANO

5th EUROPEAN
Machine Tool Exhibition
HANOVER 1957
September 15th to 24th

Information:
General-Kommissariat der 5. Europäischen Werkzeugmaschinen-Ausstellung
Hannover-Messegelände Tel.: 86501 Telegr. address: Modul Telex: 092 2728



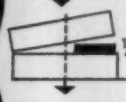
Adjusting Pacific rake angle by hand control lever

NOW...

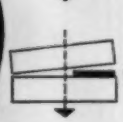
a ½" shear adjustable to cut full length ¾" plate continuously

SEE HOW RAKE ANGLE OF PACIFIC HYDRAULIC SHEAR IS CHANGED FOR PERFECT SHEARING OF ANY THICKNESS OF METAL

By increasing rake angle to ¾" per foot the shear can cut ¾" steel plate with the force normally required to cut ½" plate. A conventional shear would be permanently damaged by overload if this were attempted.



In cutting rated capacity (½"), sheer cuts exactly the same as conventional fixed rake angle shear.



In cutting ¼" steel, the rake angle is reduced to 3/32" per foot and the shear will cut strips 24" long up to 60 per minute with less twist and bow than with any conventional shear.

ABOVE, RIGHT: *¼" plate cut with Pacific adjustable rake shear*

ABOVE, LEFT: *¼" plate cut with conventional shear*

Rugged Pacific Hydraulic Shear cuts steel from 20 gauge to ¾" plate with single knife clearance. For precision cutting, knife clearance can be adjusted in 30 seconds to match plate thickness. Pacific Hydraulic Shear cuts noiselessly without shock. Knives last 2 to 3 times longer . . . maintenance downtime from blade changing is greatly reduced. Pacific Hydraulic is the safest shear. The ram, controlled by a portable foot pedal, can be stopped instantly at any point throughout the stroke in an emergency. Pacific Hydraulic cannot be damaged by overload. Independent time studies confirm that it will equal or out-produce any mechanical shear.

PACIFIC HYDRAULIC SHEAR

Mfg. by
PACIFIC INDUSTRIAL MFG. CO.
848 49th Ave., Oakland, Calif.
Plants: Oakland, Calif. and Mt. Carmel, Ill.

DISTRIBUTORS:

LOS ANGELES—Ternquist Machinery Co. • PORTLAND—Portland Machinery Co. • SEATTLE—Buckner Weatherby Co. • SALT LAKE CITY—Todd Machinery Co. • DENVER—Richard Ives & Co. • HOUSTON—Butcher, Carter & Preston Co. • DALLAS—Machine Tool Associates • TULSA—Martin Machinery Co. • KANSAS CITY, DES MOINES & ST. LOUIS—Moehlenpah Engr. Co. • NEW ORLEANS—Dixie Mill Supply Co. • ATLANTA—Allison Machinery Co. • NORFOLK—Tidewater Supply Co. • PHILADELPHIA, BALTIMORE—Calco Machinery Co. • NEWARK— G. M. Pearse & Co. • PITTSBURGH—Steel City Tool & Machinery Co. • BOSTON—Wigglesworth Machinery Co. • ROCHESTER—Macaulay Machinery Co. • CLEVELAND—Wigglesworth Machinery Distributors • INDIANA—Harry B. Green Machinery Co. • CHICAGO, MILWAUKEE—The Gute Co. DETROIT—Taylor-Thompson Machinery Co. • MINNEAPOLIS—Satterlee Corp. • LOUISVILLE—Harry B. Green Machinery Co. • ALBUQUERQUE—Richard Ives & Co. • CANADA—Williams & Wilson Ltd.

DETROIT BROACH

In the Production Picture with Industry's Leaders

LOCATION: Melrose Park Works, Melrose Park, Ill.

INTERNATIONAL HARVESTER COMPANY

.... BROACHES FOUR FACES EVERY 24 SECONDS

Removes 225 Pounds of Tough Forged Steel per Hour

The mammoth International TD-24 Crawler Tractor features "live" power and "live" traction on both tracks . . . and these tracks depend on tough forged steel links to deliver both. What's more, it takes smooth, controlled power to machine the links to close tolerances at high production rates . . . and that's exactly what's delivered by the Detroit Broaching Machine that does the job! Here are the facts:

PART: Forged steel track link, Rockwell C32-38.

MACHINE: Detroit Vertical Twin Slide, 25-ton broaching capacity, 100-inch stroke.

OPERATIONS ON EACH SLIDE:

R.H. Station: Broach locating slot, straddle broach parallel sides.

L.H. Station: Broach diagonal keyway; (As one slide is broaching, fixtures on other slide are unloaded and reloaded.)

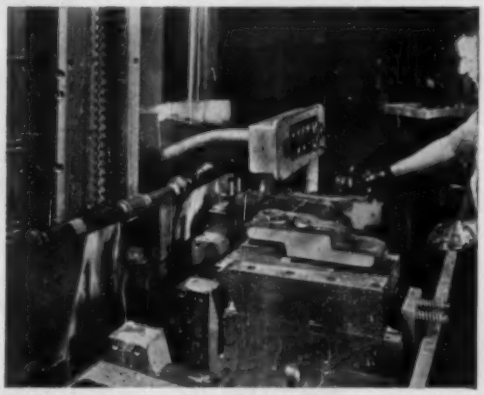
STOCK REMOVED—Approximately 5 cubic inches per piece. Cuts from the parallel sides and keyway are 0.150", balance is removed from the locating slot. Hourly stock removal is 225 pounds.

TOTAL BROACHING TIME PER PIECE: 24 seconds.

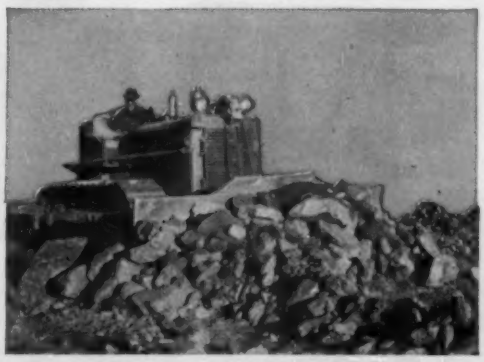
This Detroit Broaching Machine is one of several installed by International Harvester . . . and one of *hundreds* "in the production picture with industry's leaders." Let Detroit Broach offer the solution to your production machining problem, including the right machine, the most efficient tooling, and automation to any degree required. Send parts, prints or details of your problem for prompt recommendations.

Write for these Broaching Machine bulletins:

- Vertical Twin Ram
- Vertical Single Ram
- Vertical Pull Down
- Horizontal Internal
- Horizontal Continuous
- Hydraulic Presses



Tooled and fixtured by Detroit Broach specialists, the two-slide machine broaches four surfaces on each workpiece. The fixtures clamp parts hydraulically, are tilted down for broaching by shuttle action of the machine's knee. As one ram is broaching, fixtures at other are unloaded and reloaded.



This rugged, push-shearing action is accomplished smoothly with the "live" power of the International TD-24. A similar action in machining its tough forged steel track links is performed by Detroit Twin Slide Vertical Surface Broaching Machine.

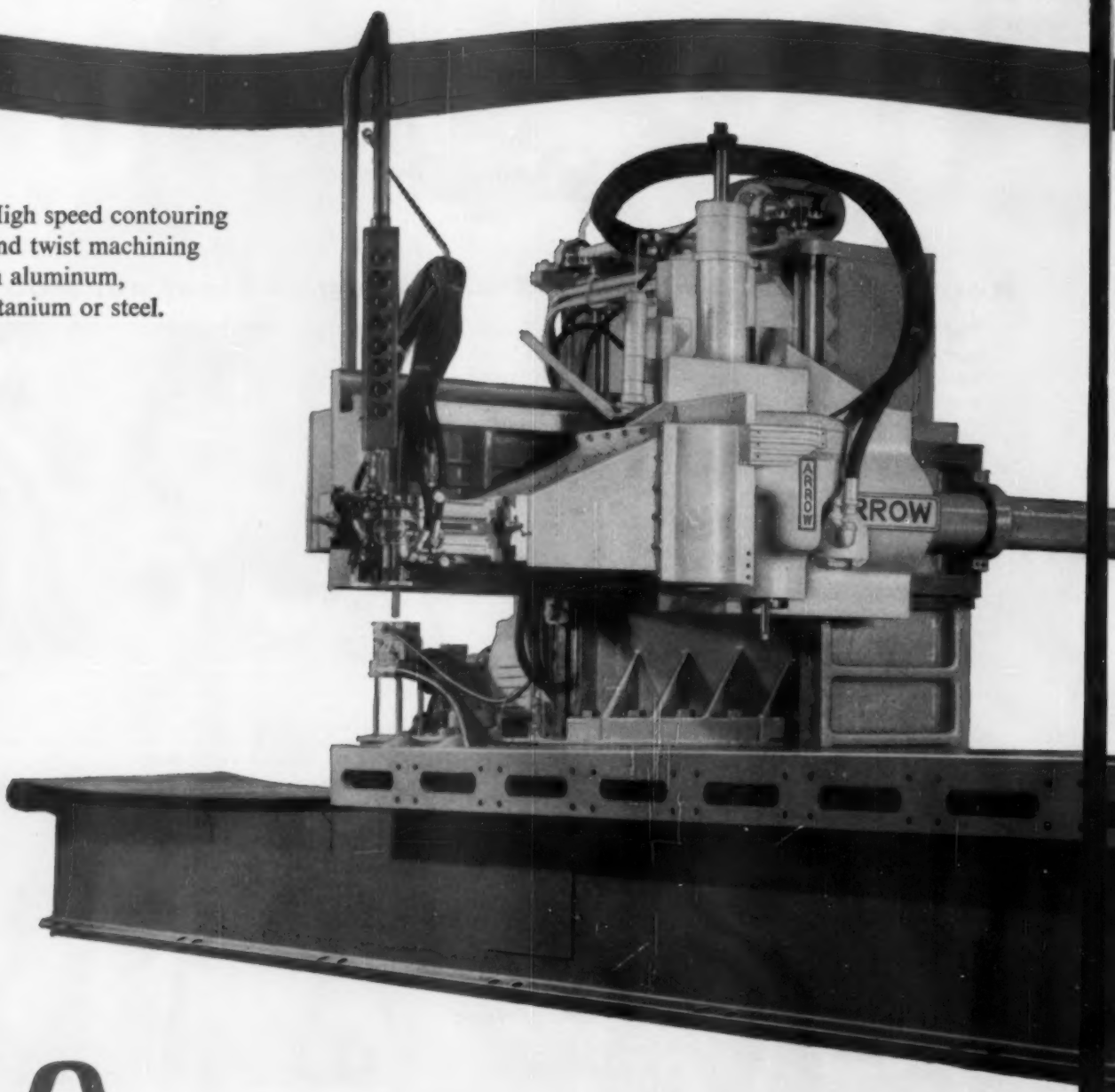
DETROIT BROACH & MACHINE COMPANY

DEPARTMENT A-6 • ROCHESTER, MICHIGAN

Announcing the

ARROW PROFILER

High speed contouring
and twist machining
in aluminum,
titanium or steel.



ARROW ENGINEERING COMPANY, INC., 120 East Market Street, Indianapolis, Indiana

The Arrow Profiler—capable of any 360° profiling, 3-dimensional contouring, swarf or twist machining. Simple to operate, highly accurate and versatile—at lower cost than other machines capable of the same work.

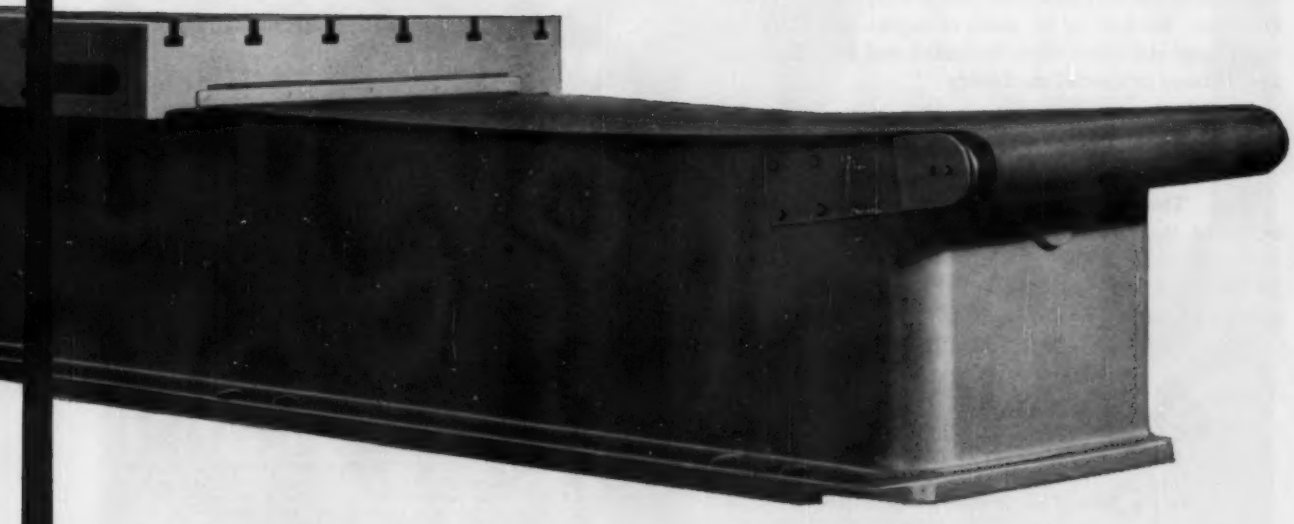
Sturdily constructed and equipped with a 20 HP hydraulic powered spindle, the Arrow Profiler has the rigidity, power and and speed range for high production machining of steel and titanium as well as aluminum. Speed changes (from 37—3000 RPM) are made through pick-off gears for high torque at low speeds (30,000 in./lbs. at 37 RPM).

Manually operated hydraulic tracing valve assures machining accuracy within ±.005. Manual operation also allows operators to push Profiler to maximum production at all times.

The Profiler table has large capacity—42″ x 144″. It is hydraulically driven, has 136″ travel, and runs on normalized cast iron V-bedway. Table feed is 0-40 ipm with rapid traverse of 100 ipm.

For swarf or twist machining, a second tracing valve is installed and the spindle is mounted on an arc-shaped way. A swarf of over 20° either side of centerline can be machined.

Write for Bulletin PR-156. Get full information on this low cost answer to your contouring, pocketing and swarfing problems.



send it out to CDT

There is no faster, more reliable way to get help with difficult tooling problems than to send it to Columbus Die-Tool. Backed by 50 years of experience, CDT has three basic objectives when designing and building tools, jigs, fixtures or special machinery.

1. Increase Production
2. Improve Quality of Product
3. Lower Production Costs

These and other benefits are reasons why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool. Perhaps we can solve your tooling problem and help you make your product . . . better, for less.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

widely used on all types of aircraft

COMTORPLUG

expanding internal gage for simple or special bores from 1/8" to 10" diameter

UNIQUE ADVANTAGES

- Indicates actual size, a fixed — not passing — reading.
- Portable — no wire, hoses, stands or electronic gear.
- Positive 2-point gaging — automatic centering.
- Assured accuracy regardless of who operates it.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Will gage work in the machine.
- A shop tool for all-day every day use.

Precision in the palm of your hand . . . and accurate regardless of who uses it. Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance and other volume-precision plants.

COMTOR COMPANY
66 Farwell St.
WALTHAM 54
MASS.

GET THE FACTS — REQUEST BULLETIN 50

TANNEWITZ

VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.

The TANNEWITZ WORKS Grand Rapids, Michigan

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2301B North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301B NORTH 11TH ST., ST. LOUIS 6, MO.

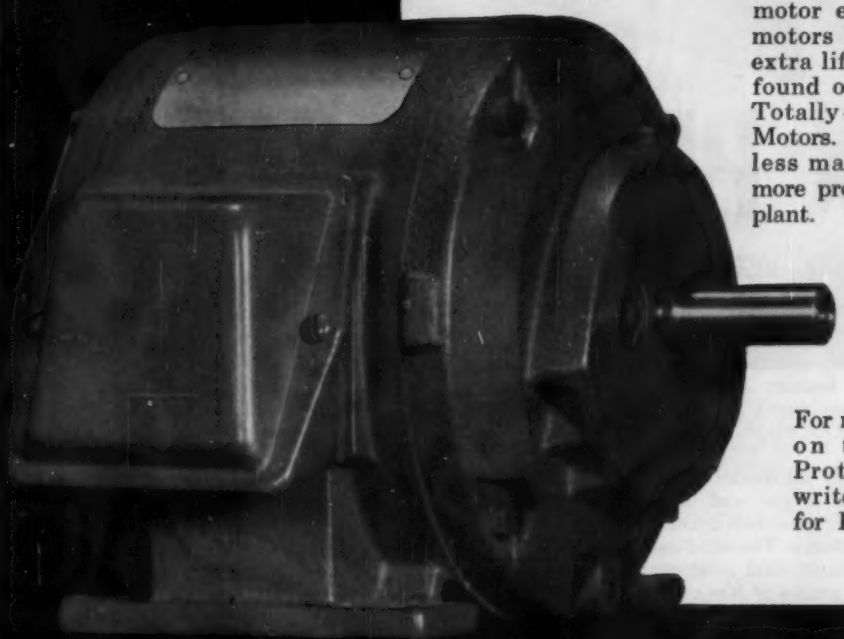
the world's only

TOTALLY-PROTECTED MOTOR

When we speak of Totally-Protected, we mean superior frame design with rigidity for heavy load conditions. We mean Metermatic bearing lubrication, acid and oil-proof insulation system, and motor leads, labeled and sealed in neoprene.

Totally-Protected means all this and more, but most of all it means a new concept of motor design and construction.

This Totally-Protected concept brings you a new motor efficiency. These motors have a built-in extra life—an extra life found only in Reliance Totally-Protected A-c. Motors. You profit from less maintenance and more production in your plant.



For more information on this Totally-Protected concept, write to Dept. 16A for Bulletin B-2401.

(B-1843)

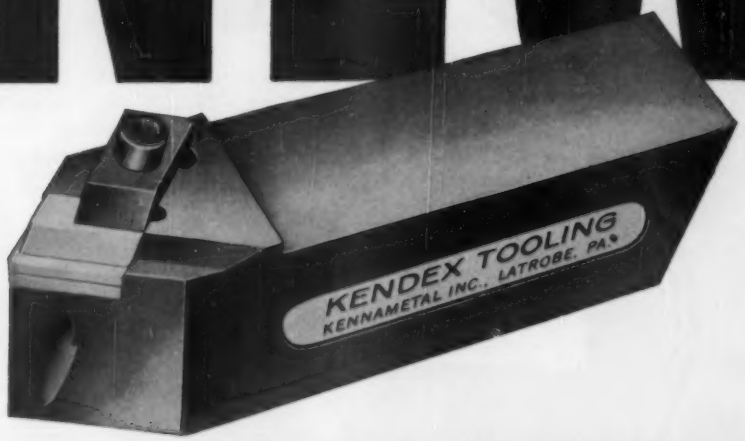
RELIANCE R ELECTRIC

AND ENGINEERING COMPANY

CLEVELAND 17, OHIO · CANADIAN DIVISION: WELLAND, ONT.

Sales Offices and Distributors in Principal Cities

NEW



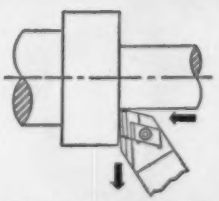
KENDEX PROFILING TOOL

The first "throw-away" insert profiling tool for both roughing and finishing cuts

Here is a new Kennametal Tool, designed specifically for today's contouring machines . . . a profiling tool that incorporates the time-saving, cost-reducing, production-boosting "throw-away" insert feature . . . the first profiling tool with an insert that won't shift . . . *the first profiling tool that can be used for roughing and intermediate cuts, as well as finishing.*

Holders suitable for practically all modern profiling machines are available in three types and 18 sizes. Simplified design provides a rigid assembly, including a hardened alloy-steel shank and clamp. The solid carbide chip breaker plate, indexable insert, and solid carbide insert seat are made of *different grades of Kennametal*—each selected for properties best suited to their particular function.

Inserts are of two general types, right-or left-hand, in four grades. These will handle practically any profiling job. Each insert provides two factory-ground, indexable cutting edges ready for instant use. Each provides a positive rake angle which reduces horsepower requirements and assures more accurate duplication of shapes due to lower tool pressures.



Rigid support and positive clamping holds the insert in position when direction of cutting forces changes as in plunge or "face-out" cuts.

The chip breaker plates of solid Kennametal have exceptional strength and resistance to "pick-up" and so assure continuous chip flow. This clamped plate gives ideal chip control over a wide range of feeds and depths of cut, and eliminates expensive chip breaker grinding.

The insert seats, also made of solid Kennametal, have an offset to provide a hard back-up surface that will not "mush out" nor permit the insert to shift under heavy cuts. The seat provides positive insert seating and protects the holder.

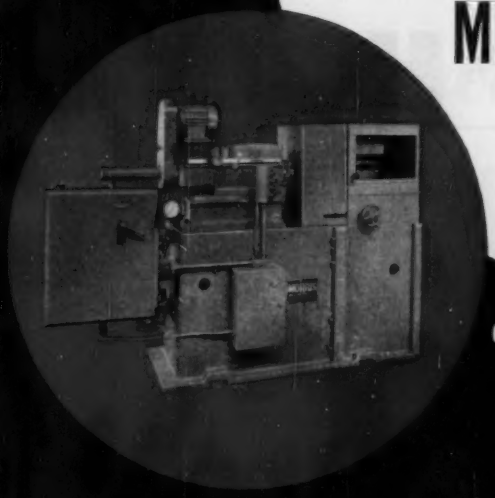
For a full description of this important new production tool, write for just-off-the-press Booklet No. B-105. Address: KENNAMETAL INC., Latrobe, Pennsylvania.

E-3050

INDUSTRY AND
KENNAMETAL
...Partners in Progress

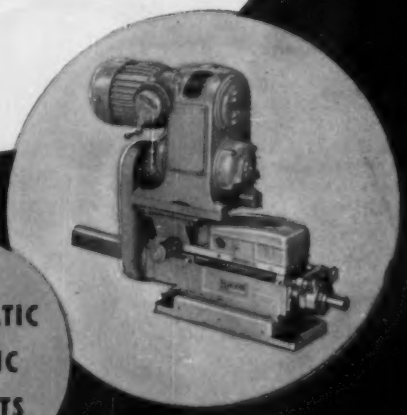
NEW

Morris GUN DRILLING MACHINES



equipped with . . .

AIR-OIL-MATIC AUTOMATIC DRILL UNITS

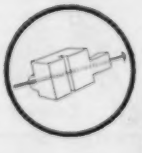


increases efficiency and ease of production for parts like these:

- Deep holes ⅛" diameter and up.

- Deep holes located off-center.

- Deep holes in out-of-balance parts.



- Deep holes in irregular shaped parts.

ALSO • Shallow holes where accuracy and finish are critical.

• Speed drilling with high rate of metal removal.

Never before, have all these advantages for gun drilling been offered in one unit, creating a wide new range of applications in automatic high production.

- **ADJUSTABLE AUTOMATIC LOAD CONTROL** . . . automatically detects dull or chipped drills, hard spots, insufficient coolant . . . assures protection of gun drills, parts and fixtures.
- **6 OR 9 INCH STROKE**
- **INFINITELY VARIABLE SPEEDS AND FEEDS** . . . speeds up to 8000 rpm . . . feeds up to 40" per min.
- **COMPLETE COORDINATED HIGH PRESSURE COOLANT AND CHIP REMOVAL SYSTEM**

write today for additional information

Modern MOR-SPEED Line

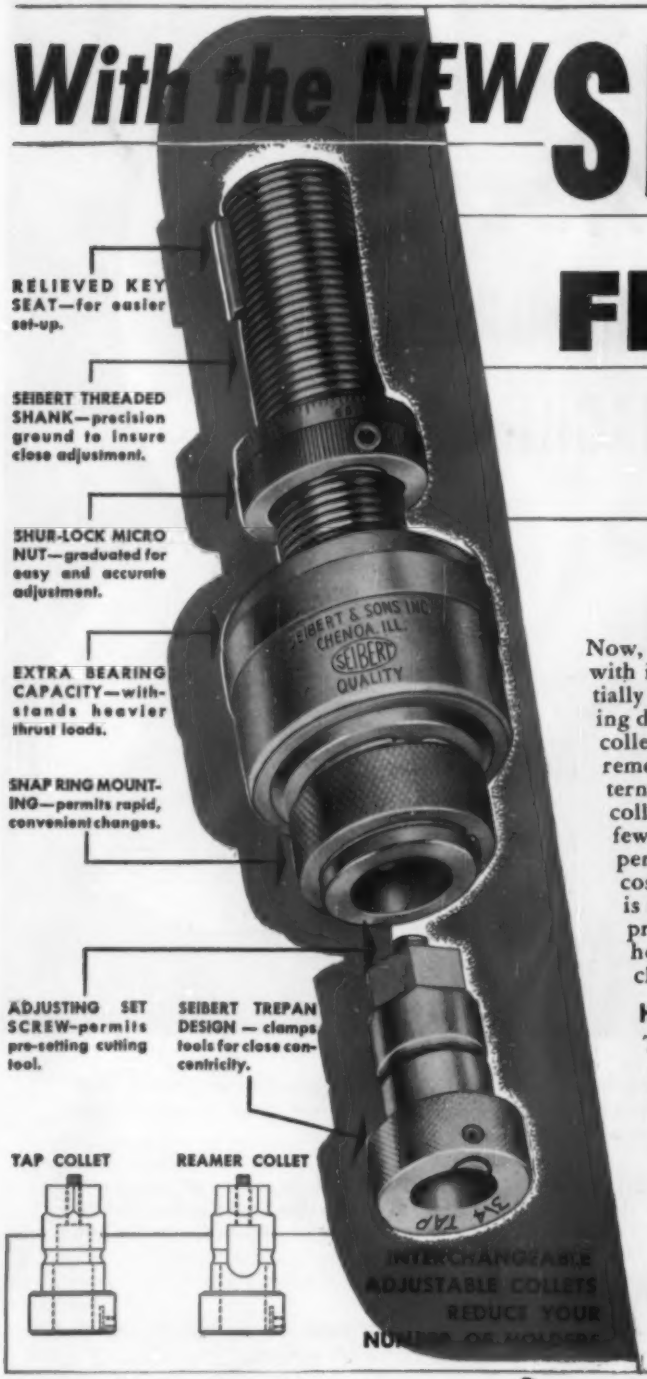
Morris

THE MORRIS MACHINE TOOL CO.
933 HARRIET STREET
CINCINNATI 3, OHIO

Convenience • Economy • Efficiency •

With the NEW SEIBERT FLOATING HOLDER

(Patent Applied For)


RELIEVED KEY SEAT—for easier set-up.
SEIBERT THREADED SHANK—precision ground to insure close adjustment.
SHUR-LOCK MICRO NUT—graduated for easy and accurate adjustment.
EXTRA BEARING CAPACITY—withstands heavier thrust loads.
SNAP RING MOUNTING—permits rapid, convenient changes.
ADJUSTING SET SCREW—permits pre-setting cutting tool.
SEIBERT TREPAN DESIGN — clamps tools for close concentricity.
TAP COLLET
REAMER COLLET
SEIBERT & SONS INC CHENOA, ILL.
SEIBERT QUALITY
INTERCHANGEABLE ADJUSTABLE COLLETS REDUCE YOUR

Fast Change Pre-Setting Collets Reduce Number of Holders Needed

Now, with the new Seibert Floating Holder equipped with interchangeable auxiliary collets, you can substantially reduce costs on tapping and reaming jobs requiring duplicate pre-set tooling. As illustrated, the auxiliary collet is snap-ring mounted in holder for quick and easy removal. No wrenches or drifts are required. An internal adjusting set screw permits pre-setting tools in collet without removing holders. Thus you require fewer holders per job, and because collets are inexpensive you effect substantial savings in overall tool costs. Close concentricity is maintained because tool is accurately held in collet by trepan clamp which is precision machined to close limits. Elimination of hex nut clamping principle also provides extra clearance when tapping in counter bored holes.

Heavy Duty Holder Assures Long Service Life

The holders are heavy duty roller-type and are especially designed with extra bearing capacity to assure long service life. All shank types are available in a range of sizes including the adjustable adaptor shank illustrated. Send for full information today on these new cost cutting tools.

WRITE FOR COMPLETE DATA

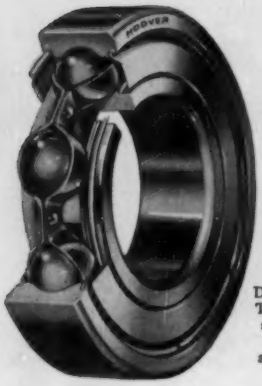
Get the complete story on the new Seibert Floating Holder. Ask for illustrated specification sheet or have a Seibert Sales Engineer call at your plant to check over your tooling requirements.

Tension or Compression Tap Drivers
800 Series Spindle Extension
900 Series Spindle Extension
Sur-Lock Adjustable Adapters

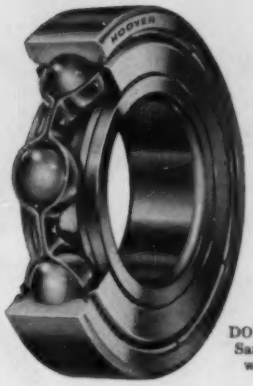
SEIBERT

SEIBERT & SONS, Inc. 1004 E. 24th Street • CHENOA, ILLINOIS

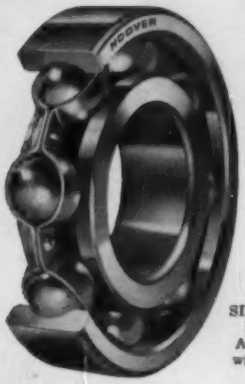
QUALITY MULTIPLE DRILL SPINDLE AND PRODUCTION TOOLS



DOUBLE SEAL—
Teflon contact seal shown. Available with snap ring and with single or double seal.



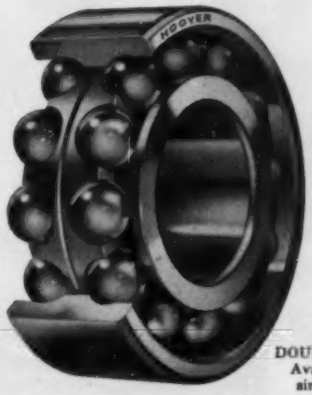
DOUBLE SHIELD—
Same sizes available with single shield.



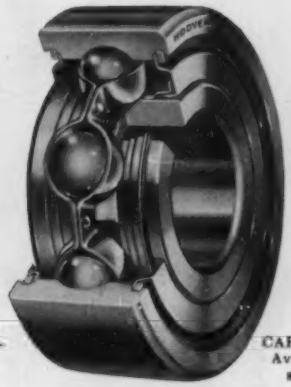
SINGLE ROW RADIAL—
Also available with snap ring.

when you want quality

COMBINATION FELT SEAL AND SHIELD—
Either standard or wide outer ring.



DOUBLE ROW—
Available with single shield.



CARTRIDGE—
Available with snap ring.

you want hoover

When you want *quality* bearings to add to the performance, long life and smooth operation of your products, you want Hoover Ball Bearings.

Hoover Ball Bearings combine the exactness of *Micro-Velvet* Lapped Balls with the smoothness of *Hoover Honed* Raceways. The result . . . top quality bearings that assure unexcelled performance —quietness—long life—and heavy load capacity.

Investigate Hoover's line of ball bearings in the light, medium and heavy series. Their microscopic precision adds up to your best buy in ball bearings. Manufacturers are invited to call in Hoover engineers for technical assistance. Write for information.

Micro-Velvet and *Hoover Honed* are Hoover Trademarks.

HOOVER BALL AND BEARING COMPANY, ANN ARBOR, MICHIGAN

Send information about

- ☐ Single Row Radial Bearings
- ☐ Bearings with Shields
- ☐ Bearings with Seals
- ☐ Combination Shield and Seal
- ☐ Cartridge Bearings
- ☐ Double Row Bearings

Hoover Ball and Bearing Company, Ann Arbor, Mich.

Please send information checked. Mail copy of "Hoover Handi-Book of Anti-Friction Bearings."

Name_____

Title_____

Company_____

Address_____

City_____ State_____

AM-16

Wondering who makes . . . BEARINGS? . . . GEARS?
. . . FASTENERS? . . . GRINDERS?
. . . or any of the 1001 operating items and machines you need?

Here's an up-to-date single volume buying guide and production aid—

AM's Production Planbook and Buyers' Guide Issue

New York—If you refer frequently or occasionally to the Buyers' Guide section of your 1957 Production Planbook and Buyers' Guide Issue published by AM in Mid-November, 1956, you are right in line with 93% of recently surveyed American Machinist subscribers.

Of those answering the question, 70.3% refer to the Buyers' Guide Section "occasionally" or an average of 2.5 times monthly; while another 21.7% use it "frequently" averaging 2.8 times per week. 88.7% of respondents state they refer to the advertising pages for product information.

Over 7000 Sources of Supply—1400-plus Headings

Typical listings in 107-page Buyers' Guide Section. Names of advertisers in the issue are shown in bold face with page numbers of advertisements, for easy reference by subscribers wanting full product information.

Readers' Comments

Many subscribers added comments to the questionnaires they returned. Samples:

"Your 1957 Production Planbook and Buyers' Guide issue is better this year than I ever saw before. It is very well arranged in all departments, and with the addition of the Buyers' Guide, it makes a good year 'round book and I am very proud to own it." *Plant Manager*

"We have found this 'Guide' very useful to an extent that it is our 'first source' when looking for information." *Superintendent*

"Your Buyers' Guide is of particular interest at this time as we are soon to move into a new plant with some new machines and tooling." *Production Controls Supervisor.*

"A very informative publication that is extremely helpful especially in regard to the Buyers' Guide Section. An up-to-date Section such as this is always of great value with the ever changing products and markets of today." *Factory Manager*

"Information contained in the issue pertaining to types of machine tools, general descriptive data as well as the manufacturer's identification and address often aids to expedite the gathering of initial ideas for further development." *Works Supervisor*

"Consider having advertisers take a page to list their distributors so buyers can find them and not accept substitutes." *Consultant*

"I find it very helpful as a source for new equipment such as valves, hydraulic cylinders, relays. Also as a reference for a source of material specified by customers when designing new projects." *Production Supervisor*

1958 Edition Now in Preparation

And here's good news: AM's *1958* Production Planbook and Buyers' Guide Issue will be published in *Mid-September, 1957,* to reach you just in time for Fall-Winter production planning.

You'll find 11 idea-stimulating sections treating everything you need to plan ahead for a high-production-level 1958—all wrapped up in a manageable, single volume, working reference issue.

Flat-opening, thumb-indexed and classified by topic, American Machinist's 1958 Production Planbook and Buyers' Guide Issue is easy to use and refer to throughout the year.

Exclusive Editorial Features

Production "Nuggets" — declared highly useful and enthusiastically endorsed by 4 out of 5 surveyed subscribers — are the essence of production ideas classified by subject matter, and, for ready reference by subscribers who want more specific details, drawings, and diagrams, issue dates and page numbers of the source are included.

"Names in the 'Nuggets'"—lists of the various trade names and company names appearing in the "Nuggets" sections to help you take quick action on production ideas, stimulated by the "Nuggets."

"Developments to Watch in '58," found useful by 90.5% of surveyed subscribers, provides you with a handy check-list against which you may rate your shop procedures and requirements, as compared to the latest production ideas and techniques.

Manufacturers Free Literature — lists of helpful literature offered by manufacturers, classified by type, following each "Nugget" section.

A Year-'Round Ready Reference

All these features will appear in appropriate sections as shown at right—provide an additional, unique editorial service without extra charge to subscribers—make American Machinist's 1958 Production Planbook and Buyers' Guide Issue an authoritative, complete ready reference of

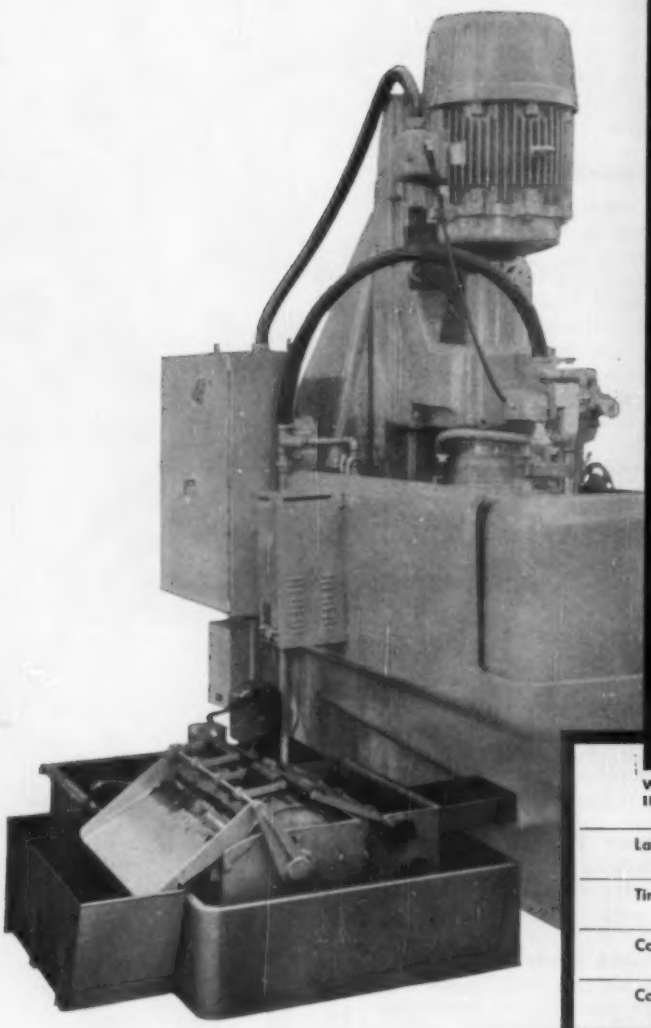
How-to-do it
What-to-do-it-with
Where-to-buy-it

you will want to refer to the year 'round.

1958 OUTLOOK
MANAGEMENT, PERSONNEL A
MACHINING B
TOOLING C
PRESSWORKING, MOLDING, CASTING D
INSPECTION, TESTING, QUALITY CONTROL E
ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) F
MATERIALS, COMPONENTS G
MATERIALS HANDLING, SERVICES H
PRIZE IDEAS, REBUILT EQUIPMENT I
BUYERS' GUIDE J

BARNESDRIL
magnetic separator saves $152.50 weekly

...on grinding operations



An Eastern manufacturer installed a BarnesdriL Magnetic Separator on a Hanchett Grinder. After the separator had been in operation approximately a year, they compared grinding costs against the costs previous to the separator installation. These figures showed a weekly savings of $152.50.* The installation cost was returned in savings in less than 6 weeks.

All coolant from the grinder continuously recirculates around the drum of powerful permanent Alinco Magnets in the separator. Swarf, chips, and other ferrous particles are removed resulting in the decreased grinding costs shown. Not shown, but important factors are, the decrease of dermatitis and improved finish of ground parts.

For complete information about BarnesdriL Magnetic Separators, call your BarnesdriL Representative or write for Bulletin No. 3004.

*

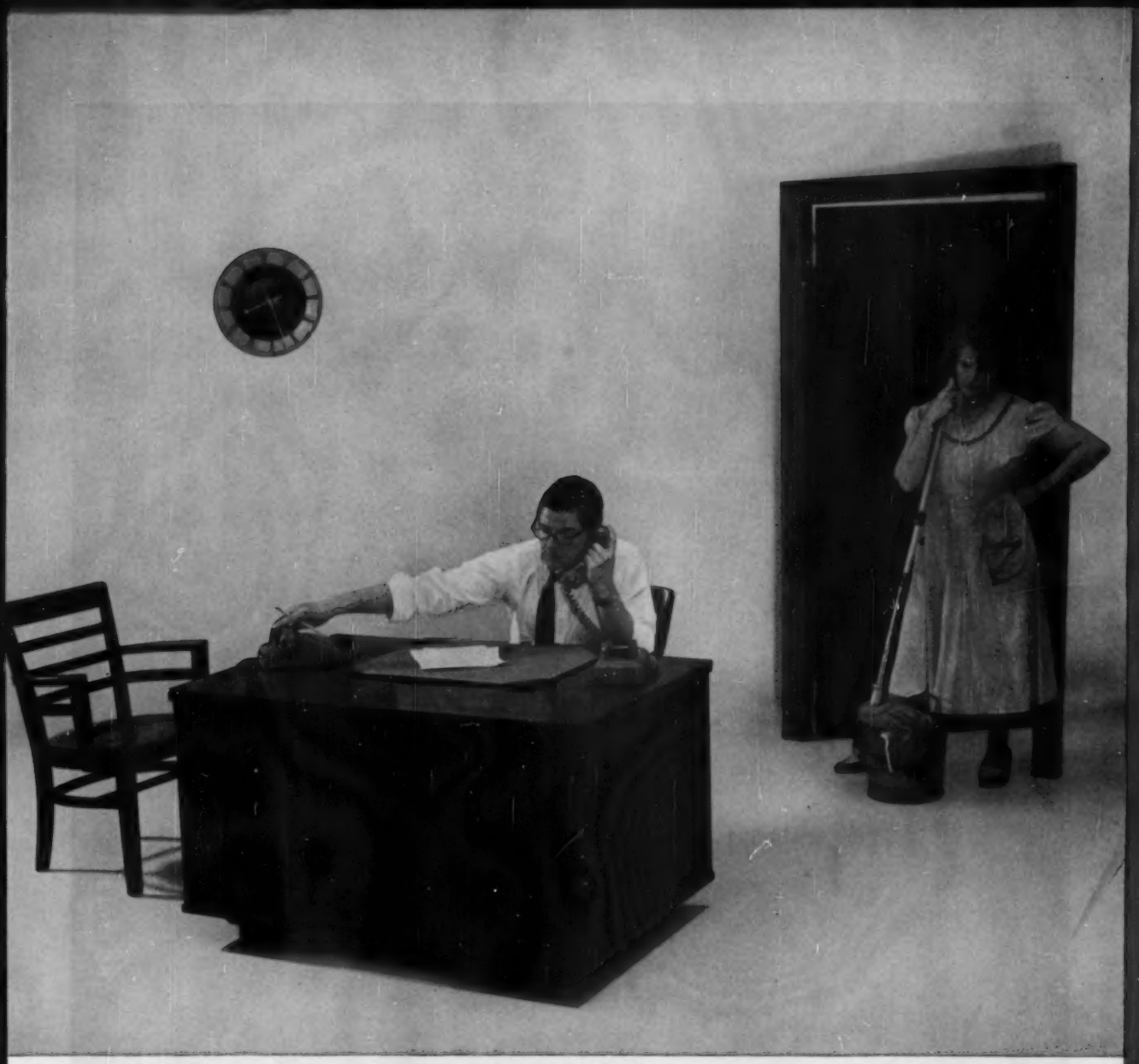
WEEKLY COST COMPARISON BEFORE AND AFTER INSTALLING A BARNESDRIL MAGNETIC SEPARATOR

	Before	After
Labor Consumed Cleaning Coolant System @ $1.00 per hr.	$ 12.00	$ 2.00
Time Lost by Machine Operator @ $1.50 per hr.	18.00	3.00
Coolant Compound Used @ $1.50 per gal.	21.00	4.50
Cost of Wheel prorated weekly	37.50	26.50
Machine downtime @ $10.00 per hr.	120.00	20.00
Totals	$208.50	$56.00
Total Weekly Savings	**$152.50**	

50th year

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road



Cracked shaft in Valdosta... His job: get a new one down to Georgia by tomorrow noon. It's an emergency case, but it's not as tough as it sounds.

He's backed by the press industry's largest parts department... by a million dollar parts inventory in two plants... by telephone and teletype tie-ups between Parts Headquarters in Hastings, Michigan and Toledo and local sales and service centers throughout the country.

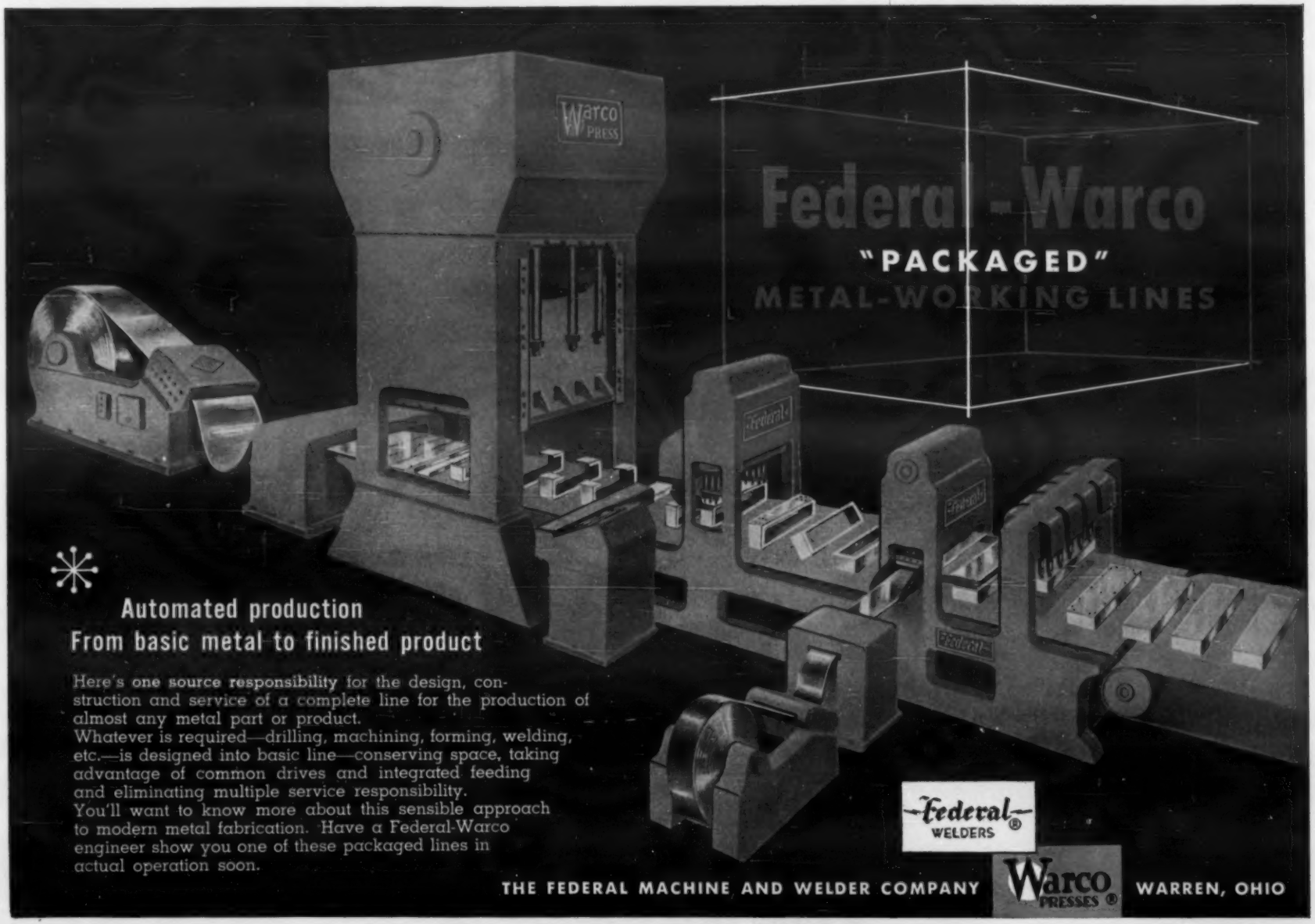
Which is another reason why we say, "Bliss is more than a name... it's a guarantee."

BLISS
SINCE 1857

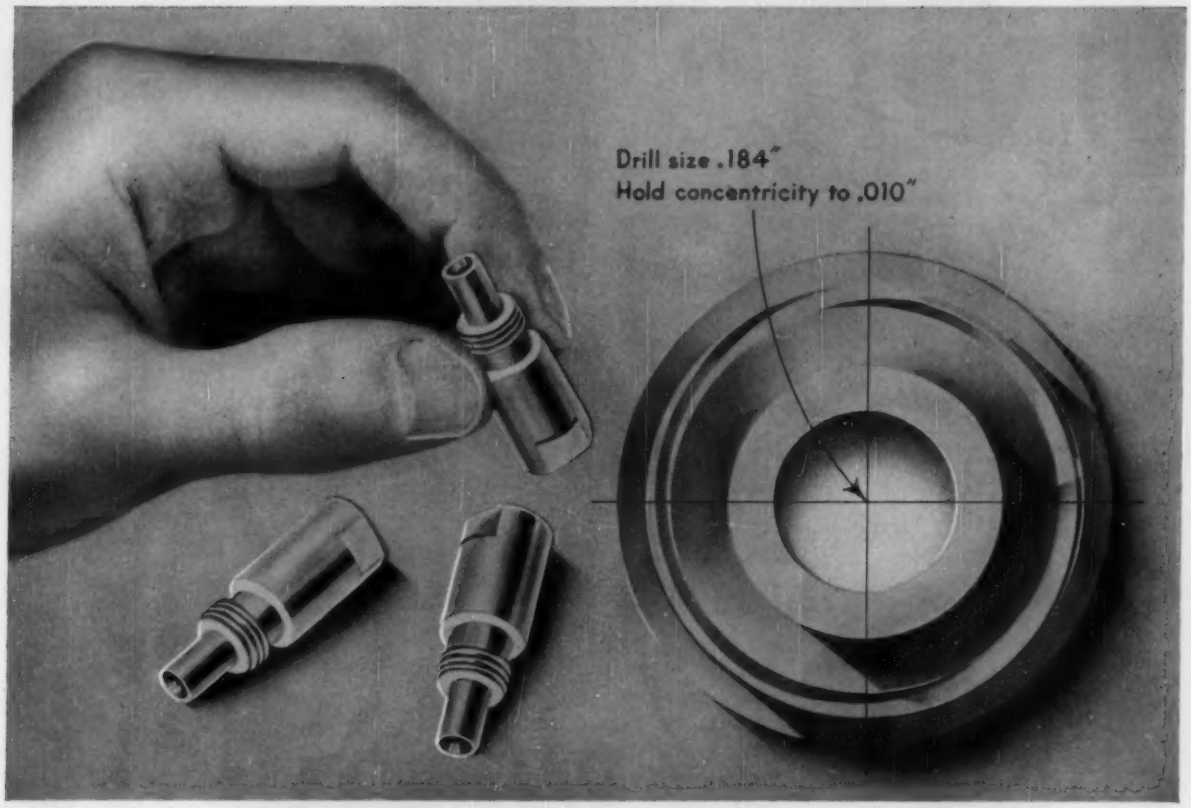
E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • MILL ROLLS • DIE SETS • CAN MACHINERY • ORDNANCE


Warco PRESS
Federal-Warco
"PACKAGED"
METAL-WORKING LINES
Federal
Automated production
From basic metal to finished product
Here's one source responsibility for the design, construction and service of a complete line for the production of almost any metal part or product.
Whatever is required—drilling, machining, forming, welding, etc.—is designed into basic line—conserving space, taking advantage of common drives and integrated feeding and eliminating multiple service responsibility.
You'll want to know more about this sensible approach to modern metal fabrication. Have a Federal-Warco engineer show you one of these packaged lines in actual operation soon.
Federal® WELDERS
Warco PRESSES®
THE FEDERAL MACHINE AND WELDER COMPANY
WARREN, OHIO

How Anaconda can help you get the exact Rod to fit the job



THE broad line of Anaconda free-cutting copper and copper-alloy rods gives you widest latitude in selecting from warehouse stock the precise rod for most screw machine jobs. But every once in a while there are special requirements.

One company's problem: The M. J. Grass Screw Machine Products Co., Buffalo, N. Y., machines a part for a gas-burner base from ½" round free-cutting brass rod. Specifications call for a hole 1 1/16" deep by .184" in diameter—with concentricity held to .010".

With standard free-cutting brass rod the drill had a tendency to wander, running the concentricity off as much as .024". To correct this, The American Brass Company provided rod stock with a minor variation in fabrication for deep drilling. This free-cutting brass rod has a slightly harder core, which minimizes the tendency of the drill to run off center at the high drilling speeds used. Now M. J. Grass holds the concentricity to .008" or under. With regular free-cutting brass, rejects ran as high as 15%. With the deep-drilling rod, there are no rejects.

Your requirements: Anaconda Rods are consistently uniform in composition, temper, and free-cutting characteristics. Consequently, they make possible easy duplication of cutting speeds and feeds known to be satisfactory from previous job records.

When you need special physical characteristics, such as a harder core for deep drilling or additional ductility to permit spinning or cold forming after machining, either the temper, the alloy, or both can be adjusted to meet your requirements.

Free technical service: It is the function of the Technical Department of The American Brass Company to assist metal users in the solution of special problems. This service is at your disposal without charge.

Comprehensive data on composition and machinability of standard Anaconda Alloys, standard specifications, weights, and dimensions of standard rods is available in Publication B-3. For this booklet – for special technical assistance – write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. A770

ANACONDA® RODS FOR SCREW MACHINE PRODUCTS

MADE BY THE AMERICAN BRASS COMPANY

Hamilton press line expanded to include medium size presses

Pictured above is a new Hamilton Gap Press recently installed at the Eaton Manufacturing Company, Cleveland, Ohio. This new large-bed press stamps out the larger grille guards which the latest model cars are calling for.

The capacity of this press is 250 tons and the speed 28 to 30 strokes per minute. Bed area is 90 in. right to left; 36 in. front to back. It is one of a new line of single and double-crank presses ranging from 100-300 tons capacity.

Write to Hamilton Division, B-L-H Corporation, for full information and specifications on this new line of heavy duty Hamilton presses.

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

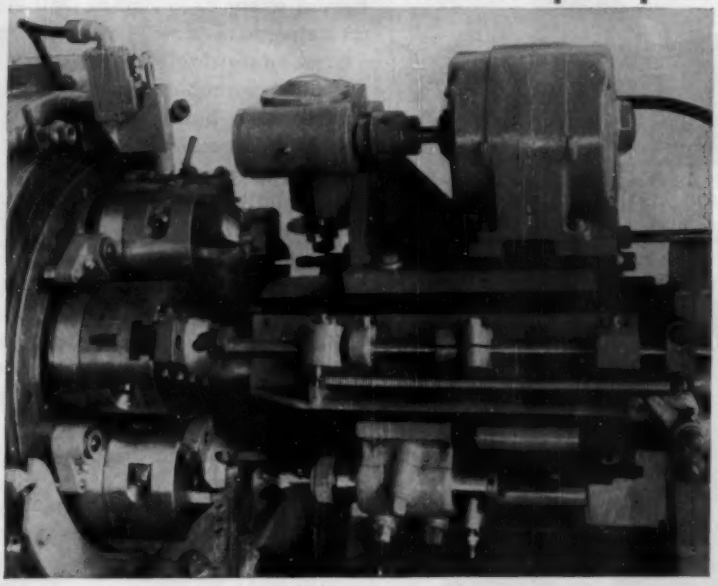
Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

BALDWIN BLH LIMA-HAMILTON

...ask BAIRD about it

DRILL ▪ BORE ▪ REAM ▪ RECESS ▪ FORM RADIUS ▪ MILL SLOT

44.5 seconds per piece



It pays to combine hard-to-handle operations on a versatile BAIRD 76H CHUCKER

industry's most versatile high production chuckers

A glance at this photograph will show you how straightforward and "clean" the arrangement is. Yet a wide variety of operations is being performed to close tolerances on a difficult workpiece.

A unique feature is the milling of the locating slot in the direct center of the part. The milling is accomplished by stopping and accurately locating the chuck. This locating slot is used on all subsequent operations on other machines. The forming of the shape on the lead of the hole, plus the grinding relief, is done by a combination slide with a form tool.

The outer face is machined from the cross slide, which incorporates a relieving motion to eliminate draw-back marks.

Sequence of Operations: Drill, bore and ream .735 - .739 center hole, face end, recess back of center hole for grinding relief, form radius on open end of hole (combination slide), and mill .1875 ± .001 locating slot.

Production: Cycle time 44.5 seconds per piece, 80 pieces per hour gross.

Every manufacturer who has installed Baird Automatic Chuckers knows them as rugged, dependable producers of amazing versatility . . . easy to re-tool when the job changes. We'll be glad to estimate and give our recommendations on your prints or samples. Write Dept. AM.

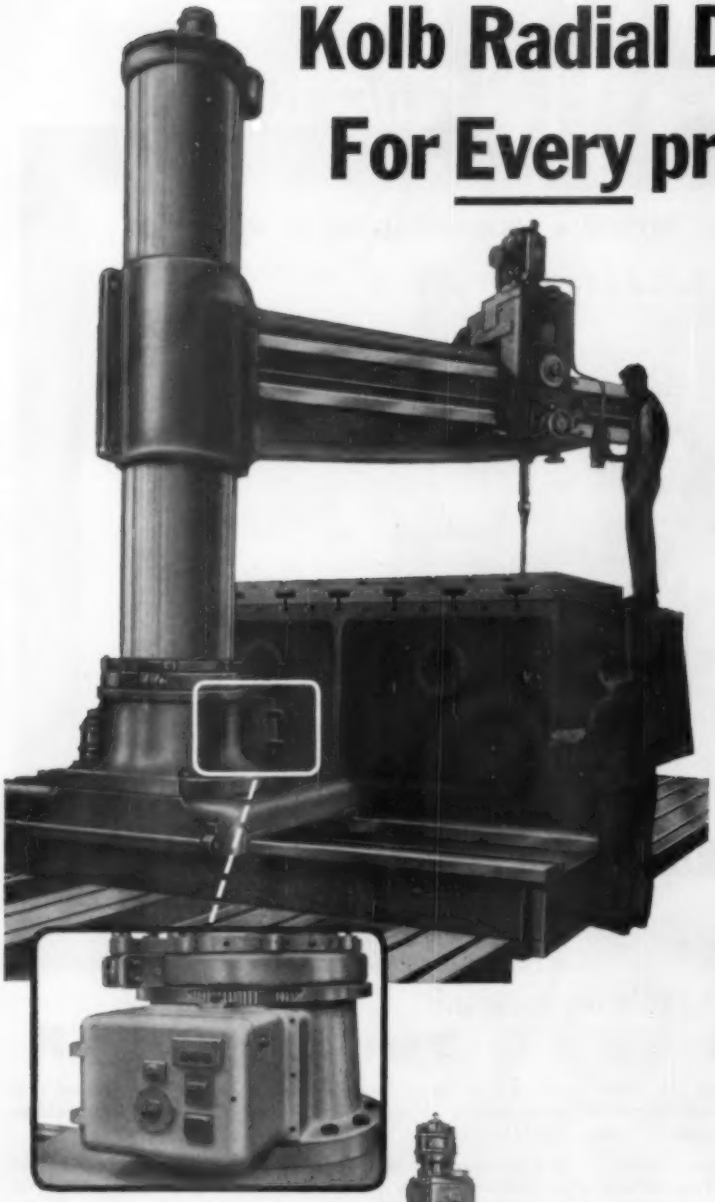
Interested in Deferred Payment? . . . "ask Baird about it."

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

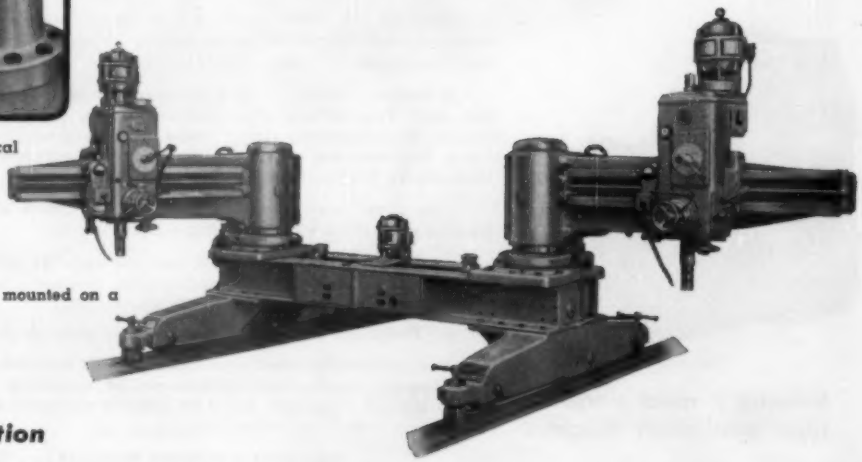
6BA56

Kolb Radial Drills
For Every production need



Behind every Kolb Radial Drill stands an impressive combination of many years' manufacturing experience, proven performance and expert factory service. Kolb has been designing and making high precision drilling machines for over 50 years. More than 200 Kolb Radial Drills are handling every kind of job – from light to heavy duty – in the United States alone. And available for each of these machines – whenever needed – is the rapid, dependable service of American Kolb Corporation's trained technicians. Kolb supplies standard radial drills with arm lengths from 26 in. to 14 ft., column diameters from 7½ in. to 40 in. and drilling heights up to 14 ft. or more – with pre-selection of up to 18 feeds and 36 speeds. Electro-hydraulic locking of the column and drilling head is controlled by a single push button – while similar locking of the arm occurs automatically in conjunction with the arm lift motor. Kolb will also meet special requirements for any type of radial drill needed for optimum production.

Controls for electro-mechanical swinging of the arm.



Kolb twin radial drill for drilling large steel plates — mounted on a chassis with motor drive.

Write for Complete Information

COSA — *nationwide sales and service of precision machine tools — from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

In Canada contact Cosa Corporation of Canada Ltd., 1160 Lakeshore Road, Long Branch, Toronto 14, Ontario

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Nuts — their use and abuse

With bolts tightened to high load levels, nut performance becomes critical.

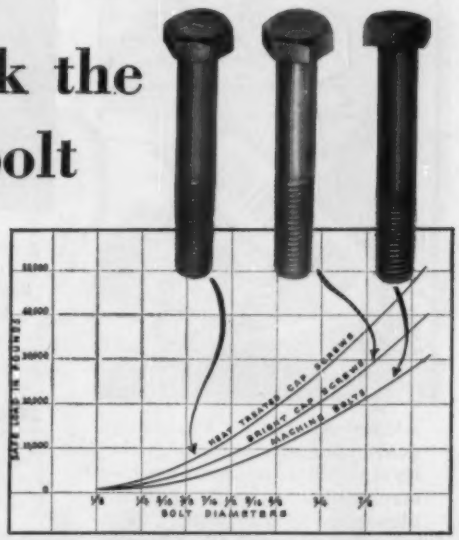
A nut produces bolt tension by rotating and advancing on the bolt threads. To do this, there must be a mating condition of threads, which is influenced by thread lead. Lead is a matter of tolerance only before bolt is stressed. When tightened, the nut is then under compression and threads tend to contract; the bolt is in tension, and threads tend to stretch. Lead of thread is affected–elastically *before* yield point, permanently *beyond* it.

This shortening of one lead and lengthening of the other has two effects. (1) The load distributes unequally along the threads (2) Torsion on bolt increases. Something has to give. For high tensile bolts especially, it is better for the nut to do so. A nut therefore should be soft enough so that it deforms plastically and compensates for off-lead. If it does, it *distributes* the load and can advance to increase tension.

"SOFT" NUTS DO MOST JOBS

"Soft" nuts do adjust more readily than hard ones under these severe conditions. While such nuts may not be as strong in shear as heat treated ones, the important point is the bolt tension they produce. As long as the nut can pull the bolt well into its plastic range, it is doing more than its share of the job.

How to pick the right size bolt



When it comes to uniformity of dimension, quality of head and thread, and ease of assembly, all RB&W cold headed fasteners are the same. They differ mainly in tensile strength as shown here.

ALMOST all bolt and cap screw strength requirements can be satisfied from three types of *standard* fasteners without recourse to costly special alloys. In the widely used middle range of sizes, the problem is one of deciding which makes the best joint, or which proves the most economical for the job.

MORE FOR LESS

Suppose, for example, you need a bolt safe for 20,000 pounds of loading. As the chart shows, you could use an RB&W ⅞" square-head bolt, a ¾" bright cap screw, or a ⅝" heat treated one.

If you have a lot of holes to fill, use the larger, lower strength fasteners. But to cut down number of bolts, or their size (and therefore cost), go to the higher tensiles. However you gain nothing if you don't tighten high tensile bolts to their full strength.

HOW COSTS COMPARE

In terms of holding power: For each $1.00 in high tensile bolts, it costs $1.50 to provide equivalent clamping force with bright cap screws; or $1.65 with machine bolts.

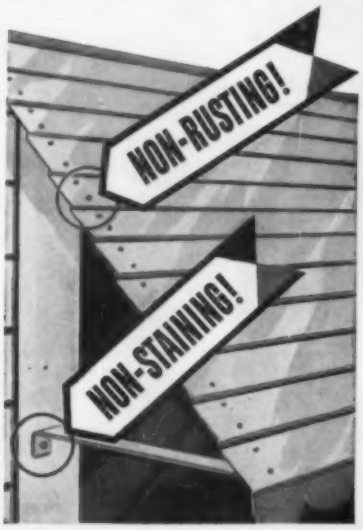
For more suggestions on fastener economy or for copy of above curves, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Spin-Lock Nuts dig in to stay tight

The photograph shows the many hardened "anchors" on the flange of a Spin-Lock Nut. These "ratchet-action" teeth require 20% more torque to loosen than to tighten. They bite in as the nut turns down on its seat. Like Spin-Lock Screws, these nuts can stay put in products subject to vibration and cyclic temperature variations. Send for bulletin.

How Alcoa Aluminum Fasteners make good awnings even better



Alcoa® Aluminum Fasteners guard your reputation for quality aluminum awnings. They insure against both galvanic and atmospheric corrosion. They provide perfect color match and lasting good looks. Specify Alcoa Fasteners for assembly and installation. Your local Alcoa distributor carries complete stocks for every requirement. He is listed in the Yellow Pages of your telephone directory.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

ALCOA ALUMINUM FASTENERS
ALUMINUM COMPANY OF AMERICA
ALCOA

Your Guide to the Best in Aluminum Value

Fill out coupon for facts, samples

Aluminum Company of America
2238-F Alcoa Bldg., Pittsburgh 19, Pa.
Gentlemen:
Please send complete specification data and samples of Alcoa Aluminum Fasteners.
Name_____
Title_____
Company_____
Address_____

WILSON "ROCKWELL"—
THE WORLD'S STANDARD OF HARDNESS TESTING ACCURACY

WILSON "ROCKWELL"
HARDNESS TESTERS

A FULL WILSON LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

FULLY AUTOMATIC
•
SEMI-AUTOMATIC
•
REGULAR
•
SPECIAL
•
SUPERFICIAL
•
MICRO & MACRO HARDNESS TESTERS

For easy, accurate production tests

Sensitive and Accurate as a precision balance—the WILSON "Rockwell" hardness tester insures the quality of your products and protects your good name as a manufacturer.

Durable as a machine tool—WILSON "Rockwell" hardness testers withstand severe daily use with a minimum of service requirements.

A staff of WILSON hardness testing experts is available to help choose the model best suited to your job—and provide quick emergency service if it is ever needed.

Write for booklet DH-325 today

ACCO for Better Values

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

ACCO

From the *American Machinist* Library of *Tips for Top Shop Men*

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

SPECIAL AUTOMATIC PRODUCTION MACHINES

designed and built to solve your machining problems for medium and large-scale series production.

Transfer machine for carrying out complete machining operations on the 2 litre engine cylinder head. Out put : 35 units per hour.

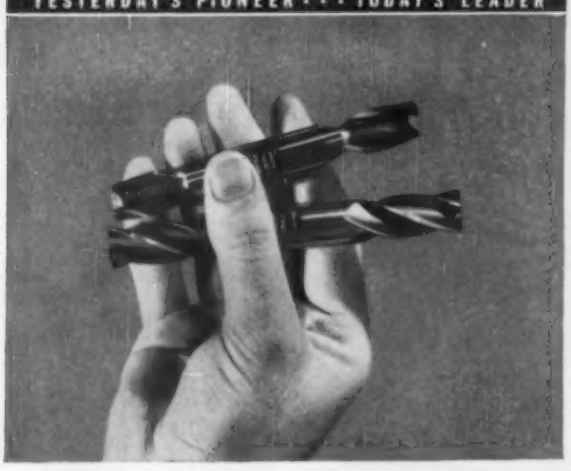
with RENAULT ELECTRO-MECHANICAL UNIT HEADS

RENAULT

RÉGIE NATIONALE

BILLANCOURT — FRANCE

YESTERDAY'S PIONEER · · · TODAY'S LEADER



EXPERIENCE—
There is no substitute

40 years' successful experience as a company in the manufacture of cutting tools means that when you buy Weldon tools you are assured of the finest.

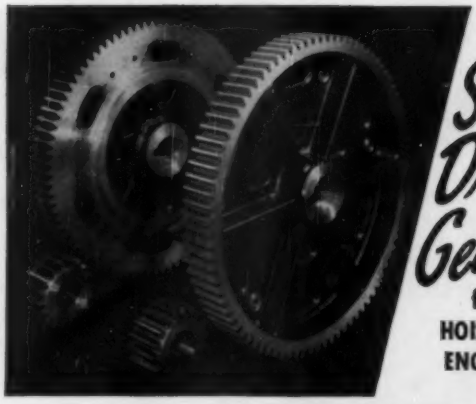
For all of these years we have consistently led the field in the origination and production of the highest quality end mills, holders and allied items.

Specialization for 40 years—that is the Weldon record—and the best of cutting tools is the result.

Weldon distributors throughout the U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO



Steel Drum Gears- for HOISTING ENGINES

Your gear requirements may never call for hoisting engine steel drum gears to pull freight cars—for which purpose Stahl manufactured the gears illustrated. However, for any gear problems, in any size or quantity, it will more than pay to get that next estimate from Stahl.

SPURS TO 72" PD. 1 DP
BEVELS TO 54" PD. 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD. 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD. 2 DP
SPROCKETS TO 72" PD. 2½" CP
RACKS TO 20 FT. LONG. 3 DP
SILENT GEARS; RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS— OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

D.O.JAMES GEARS

Every Type··· FOR EVERY INDUSTRIAL NEED

148 Pages Gear Engineering Data— Available to Gear Engineers

Please request your copy on company Letterhead— we'll mail it at once

Our 70 years of Gear Experience will prove invaluable in your Gear needs

- **CONTINUOUS-TOOTH HERRINGBONE**—The gear with the backbone, made up to 60" in diameter
- **WORM GEARS**—Generated gear tooth, 1" to 60" in diameter
- **HELICAL GEARS**—From 1" to 72" in diameter
- **BEVEL GEARS**—(Straight Tooth) From 1" to 60" in diameter
- **SPIRAL BEVEL GEARS**—From 1" to 30" in diameter
- **SPUR GEARS**—From ¾" to 145" in diameter
- **INTERNAL GEARS**—Straight tooth up to 56" in diameter. Helical tooth up to 56" in diameter

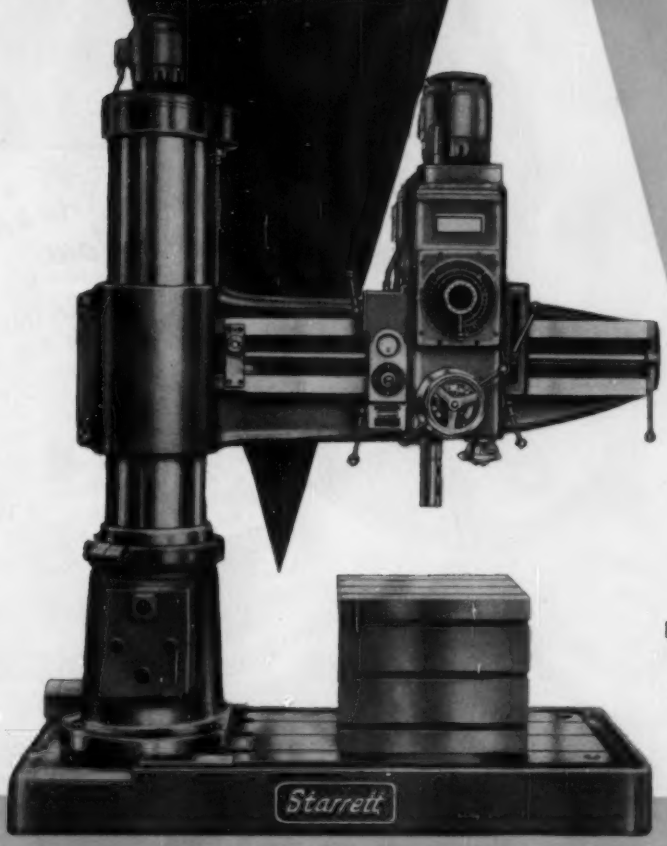
D.O.JAMES GEAR MFG. CO.

1140 W. Monroe Street, Chicago — Branches in Key Industrial Areas

STARRETT RADIAL DRILLS

WORLD'S BEST VALUES

For . . . MAXIMUM EFFICIENCY LONGER LIFE



SIZES:
2½' to 6' with 10", 12½" & 14½" columns. Ground nickle-chrome steel gears. Safety feed. Preselector depth control. Automatic lubrication.
from $1995. to $6985.

No. 5 Morse Taper with centralized electro-mechanical clamping device

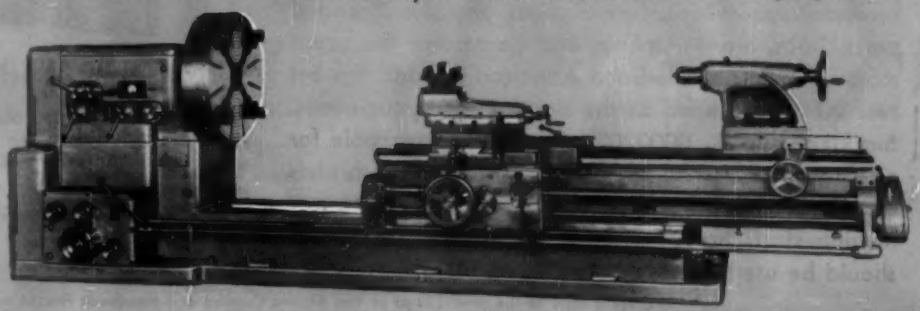
IMPERIAL LATHES

FLAME HARDENED, GROUND BED WAYS. HEAT-TREATED, HARDENED GEARS THROUGHOUT. SUPER PRECISION, ROLLER SPINDLE BEARINGS. EXTREMELY HEAVY CARRIAGE. AUTOMATIC LUBRICATION.

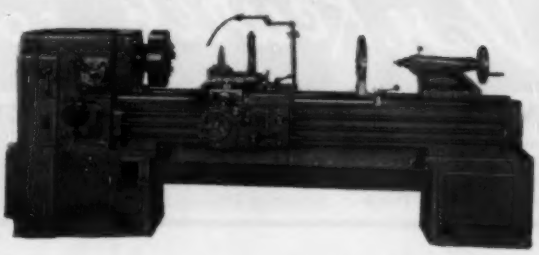
Available sizes from 12" to 67" swing, priced from $1,298 for 12" to $19,490 for 67".

Slightly higher on west coast.

MODEL P.S. 34"/61" UNIVERSAL SLIDING BED GAP LATHE **$12,990**



MODEL M.P. 24"/35" swing **$7,985**



instantaneous "preselector" for speed control

ENTAL PLANS, LIBERAL TERMS

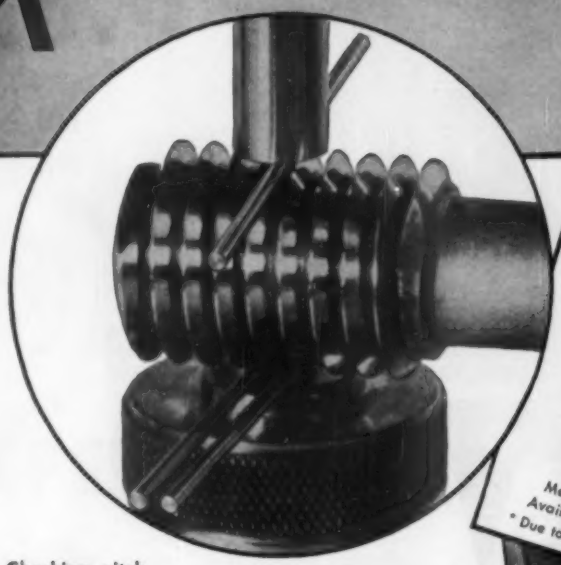
AARON
MACHINERY CO., INC.

DEP'T "A"
45 CROSBY STREET
NEW YORK 12, NEW YORK
WAlker 5-8300

Branches at: Buffalo, N. Y., Mineola, N. Y., Los Angeles, Cal.

VK THREAD MEASURING WIRES

▼ *Standard equipment everywhere*



Checking pitch diameter of thread gage by three wire method on VK Light Wave Micrometer.

VK STANDARD THREAD WIRES
Now up to 75% INCREASED ACCURACY
IN YOUR P.D. MEASUREMENT
For all standard Unified and American Threads 2 to 80 P
When you order the NEW
VK CALIBRATED THREAD MEASURING WIRES WITH MATCHED CONSTANTS
Max. Theor. Meas. P.D. Error* = .000015"
Available from stock at no increase in price.
* Due to effect of wire diameter

Every set of VK Standard Thread Measuring Wires, in addition to being within .000020" of best size, is now calibrated and furnished with matching constant. In many cases this will result in considerably more accurate pitch diameter measurements. These wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 H.S. pictured at the right will fill your needs. Similar sets to ± .000020" accuracy are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used.

Set No. 20 H.S. Thread Measuring Wires

Set No. 20 H.S. Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires....$135.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

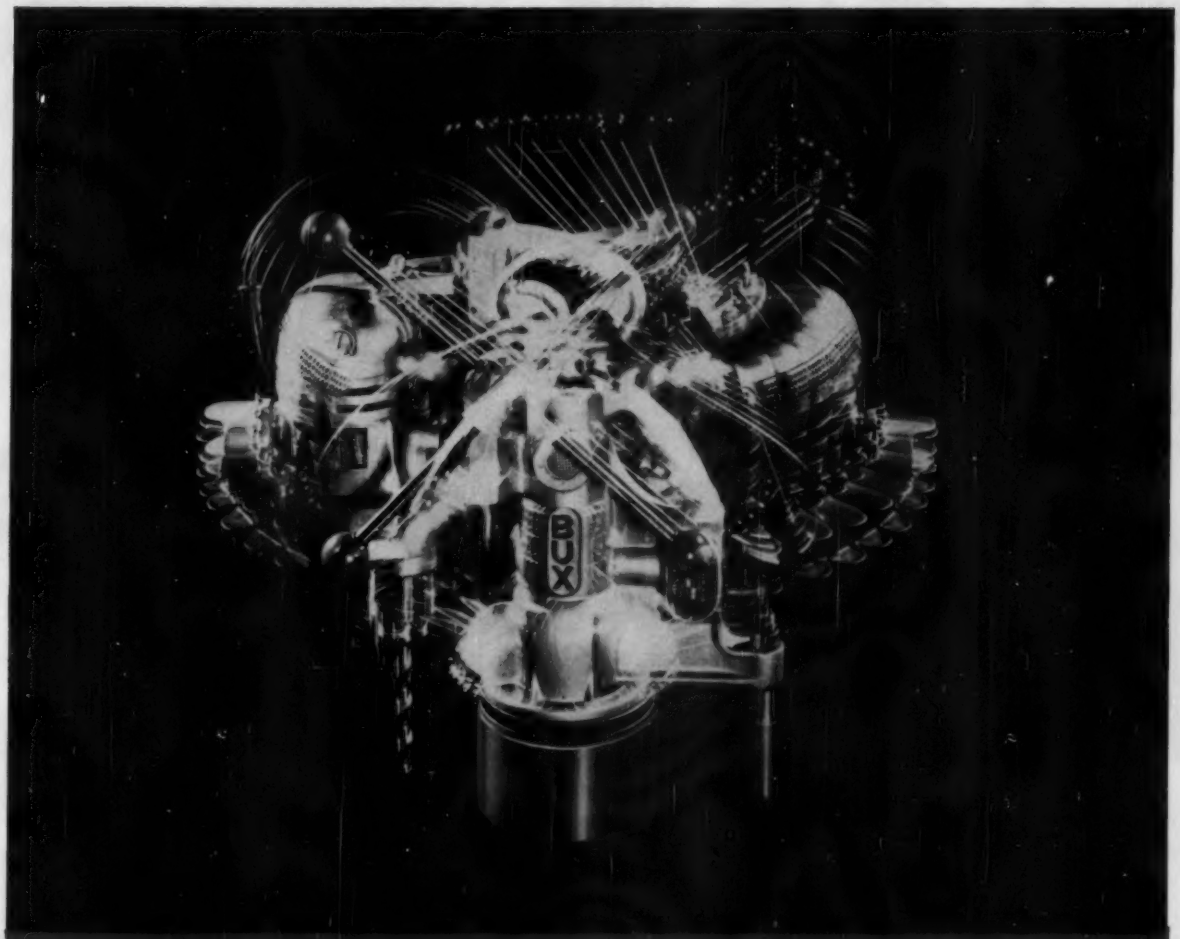
VK

38th YEAR

THE *Van Keuren* CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.



with new Bux Radial Positioner

PRECISION-ACCURATE DRILL POSITIONING—FAST!

New, positive mechanical-action Bux radial positioner assures faster, accurate alignment of Bux portable magnetic drill presses. Magnetic base remains stationary, safely holding unit to work. Simple ¼ turn of mechanical locking handle releases drill for full 330° positioning rotation. Lateral movement is provided, assuring absolute precision positioning for drilling, reaming, tapping. Powerful magnet holds drill to work on overhead or vertical working surfaces as well as flat work. Available on all Bux portable magnetic drill press units at optional extra cost.

Call or write your Bux dealer for a demonstration!

BUX

BUCK MFG. CO.
P. O. Box 692 A
1355 North 10th Street • CYpress 7-6323
San Jose, California

4368

Don't Let the Word 'BATCH' Fool You!

MANY DRYING JOBS CAN BE DONE MORE EASILY AND QUICKLY —WITH LESS LABOR

in a **BARRETT CYCLONE DRYER**

because it is . . .

- Built for large loads
  Up to 425 pounds with 3½ bushel capacity
- Extremely fast
  Surplus moisture is snapped off in seconds—remaining film absorbed quickly by natural suction or, if necessary, hot air blast.
- Designed for difficult drying jobs
  Empties water from blind holes and cupshaped parts by reverse spinning.

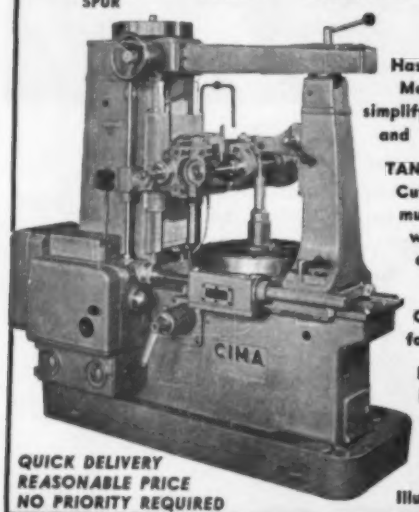
THE LEON J. BARRETT COMPANY

1800 GRAFTON ROAD **WORCESTER, MASS.**

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.

SPUR SPIRAL WORM GEAR WORM



Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

Write for Illustrated Folder

QUICK DELIVERY
REASONABLE PRICE
NO PRIORITY REQUIRED

GEORGE SCHERR CO., Inc.

COMPLETE LINE OF PRECISION INSTRUMENTS

200 AM LAFAYETTE ST. • N.Y. 12, N.Y.

MODEL D

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

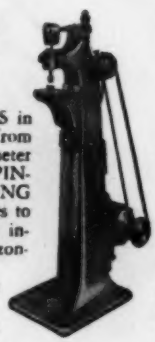
THE SHORE INSTRUMENT & MFG. CO., INC.
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

MODEL C-2

GRANT

RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

Scott Wipers* are soft, absorbent, and Perf-embossed.® This exclusive process creates angled surfaces which soak up liquids faster, give thorough cleaning action. Chemically treated for wet strength, Scott Wipers are ideal for wiping machines, tools, stock, hands, face. *PATENT PENDING

WIPER PROBLEM? Look what Crane Packing Company did with Scott Wipers!

Crane Packing Company, Morton Grove, Illinois, makes lapping machines, packings, mechanical seals. Industrial wiping was done by rags—until Crane decided this method was too costly.

Seeking a less expensive way of wiping, management switched to Scott Wipers . . . sanitary, strong, uniform and lint-free. This cut material costs by nearly 39%.

Crane found that Scott Wipers lowered the accident rate—fresh from the box, these clean, fresh, highly absorbent sheets carry no hidden particles to scratch and cut. And no buttons to mar delicate work surfaces. Scott Wipers are used in many areas throughout the plant . . . always at hand near each user, easily disposable in handy receptacles.

Like to improve product quality, boost your housekeeping efficiency, do better wiping on tools, machines, stock, hands, faces? Call your local Scott distributor, or write Scott Paper Company, Department AM-76, Chester, Pennsylvania.

SCOTT PAPER COMPANY

Makers of the famous Scott paper products you use in your home. Consult TV schedules for Scott's program, "Father Knows Best."

MODEL RC-250

SAJO FINGER-TIP CONTROL

REDUCES CUTTING COSTS

SAJO's 10" x 10" Production Hacksaw features unique patented finger-tip controlled cutting pressures assuring peak cutting efficiency plus longer saw blade life.

SAJO world famous workmanship is typified in this Model RC 250 Hacksaw. Its design and foolproof hydraulic system assure easy, trouble-free operation.

Also available—SAJO Utility Hacksaws; Model RC 30— 6" x 6", and RC 230—9" x 9".

BUILT BY SWEDISH CRAFTSMEN TO U.S. STANDARDS.
ALL SAJO EQUIPMENT IS MODESTLY PRICED.

Parts and service overnight from most major cities.

Write for full information—catalogs.

austin INDUSTRIAL CORPORATION

76F MAMARONECK AVENUE • WHITE PLAINS, N. Y.

HORIZONTAL AND VERTICAL MILLERS AND SHAPERS

From the *American Machinist* Library of *Tips for Top Shop Men*

IF you have worked with your hands, your normal tendency in a crisis will be to work with your hands again. There are times when this will impress the men who work for you, do much to knock down any idea that you're an incompetent stuffed shirt. But never forget that you're paid now for working with your head, and that headwork demands more perspective than handwork is likely to give you. Also remember the thrill you got out of achievement and give the next generation the same chance to grow.

Answers to hundreds of METALWORKING questions—complete in one EASY-TO-USE volume

What leading magazines say about this book:

Automatic Machining: "Offers quick answers to metalworking problems of a practical nature"

Design News: "Digests vast amount of original source material otherwise difficult to obtain even when one knows where to look."

Welding Journal: "Valuable aid to machinists, designers, draftsmen, and engineers."

Automotive Industries: "Storehouse of useful tables and formulas, plus . . . methods, materials, and equipment."

THE NEW
AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND
Senior Associate Editor,
American Machinist

1579 pages, 5½ x 8
774 illustrations, $11.00
Available in installments

JUST think of being able to find the answer—the dependable answer—to almost any question—quickly—layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—any detail of machine shop or drafting room practice. The New American Machinist's Handbook presents this kind of information, in the form in which you can best understand and use it.

Here is a treasury of the kind of machine shop information that will help every man to save time and avoid trouble in his own work, to go ahead on any job with confidence, and to improve his skill, reputation, and earning power.

See for yourself what this modern metalworking guide can do for you. Look the book over for 10 days free. Pay on easy monthly terms if you decide to keep it.

SEND THIS FREE EXAMINATION COUPON

McGraw-Hill Book Co., Dept. FA-6-17-57
327 W. 41 St., N.Y.C. 36

Send me Le Grand's the NEW AMERICAN MACHINIST'S HANDBOOK for 10 days' examination on approval. If satisfactory I will send (check one) ☐ $3, plus few cents for delivery costs in 10 days and $3 a month until $11 is paid, or ☐ full purchase price of book. (We pay delivery cost if remittance accompanies this coupon. Same examination and return privilege.)

(Print)
Name .....

Address .....

City ..... Zone ..... State .....

Company .....

Position .....

For price and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. FA-6-17-57

5/8" Bar Stock sheared with ALLEGHENY LUDLUM 609 BLADES

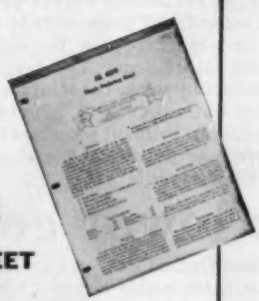
Customer reports shear blades withstand severe shock of Heavy Duty Job without bending or breaking!

A Birmingham manufacturer finds that A-L 609 blades take the tough job of shearing ⅝" bar stock in stride. A high elastic limit and fair ductility at comparatively high degrees of hardness give these silico-manganese steel blades the ability to withstand heavy shock without bending or breaking.

Besides superior shock resistance, A-L 609 has the advantages of excellent hardenability in larger sections combined with a fine grain size. Characteristics like these make 609 particularly suitable for tools that must withstand severe service. Such applications include shear blades, pneumatic tools, heavy duty punches, shanks for carbide tools, and machine parts exposed to severe shocks.

For the finest in tool steels and technical assistance to help solve your tool or die steel problems, call your A-L representative or distributor today . . or write *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

For nearest representative, consult Yellow Section of your telephone book.



Write for

BLUE SHEET on AL 609

A compilation of facts on the handling and shop treatment of A-L 609. Includes complete information on forging, annealing, hardening, tempering, etc., and detailed laboratory data on physical characteristics. *Ask for your free copy.*

ADDRESS DEPT. AM-90

For complete **MODERN** Tooling, call

Allegheny Ludlum

WSW.6624

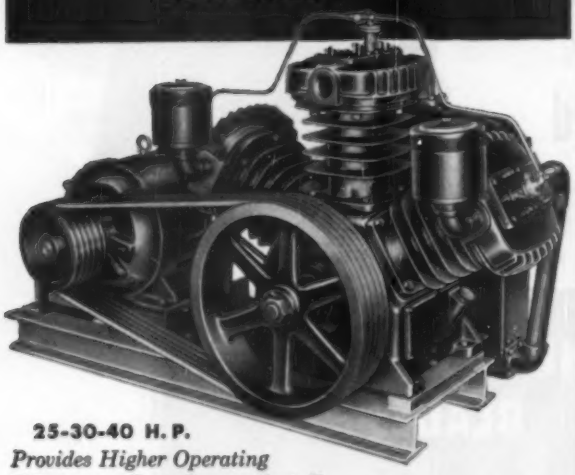
AL® FINE TOOL STEELS SINCE 1854

CURTIS MODEL C-100

Two-Stage, Air-Cooled Air Compressor

Delivers *MORE* Air...

PER MINUTE HORSEPOWER KILOWATT HOUR OF ELECTRICAL ENERGY CONSUMED



25-30-40 H. P.
Provides Higher Operating Efficiency Costs Less to Install

The Curtis Two-Stage Compressor assures a saving in your power costs. It's air cooled, thereby eliminating expensive water bills—quick and easy installation with no complicated plumbing problems.

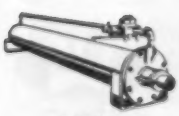
The new C-100 embodies all the well-known Curtis engineering features such as centro-ring oiling and Timken Main Bearings.

For complete information write for illustrated folder.

CAN COUNT ON YOU
REMEMBER...

Curtis

OUR 103rd YEAR
MANUFACTURING COMPANY
PNEUMATIC DIVISION
1924 Kienlen Ave. St. Louis 20, Mo.



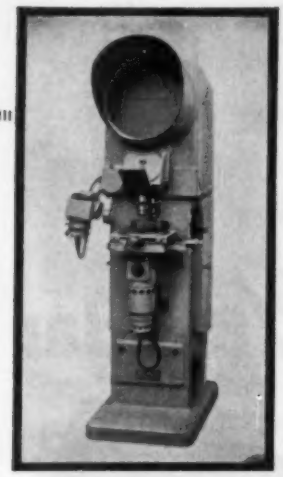
AIR HOISTS
AIR CYLINDERS

AUTOMOTIVE
AIR COMPRESSORS

PACKAGED AND REMOTE AIR CONDITIONING

CM-31

NIKON OPTICAL COMPARATOR, MODEL III



NIKON OPTICAL COMPARATORS

offer greater versatility

By means of a dual illumination system (episcopic and diascopic) the Nikon Optical Comparator permits the study and measurement of surface textures as well as edge contours. A lens turret provides rapid, convenient changeover of magnifications; lenses are available at 10, 20, 31.25, 50, 62.5, 100, 120 and 230X magnifications.

and brightest illumination

A unique condenser turret permits rapid selection of condensers to match each lens magnification for optimum illumination efficiency. This feature, in combination with the fully coated Nikkor optical system, provides an exceptionally brilliant projected image, uniformly bright from edge to edge on the viewing screen.

at lower cost

A Nikon Optical Comparator is available at considerably less cost than you would expect from an instrument that offers such accuracy and versatility.

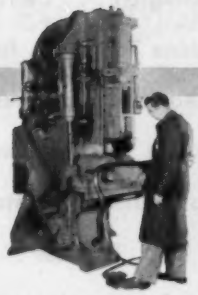
For complete details, specifications and prices on floor and table models, write to Dept. AM-6.

NIKON INCORPORATED
251 Fourth Avenue, New York 10, N. Y.

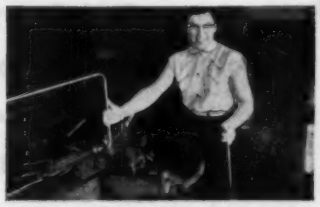
• *Stereo and Research Microscopes* • *Optical Flats* • *Surveyor's Transits and other precision optical equipment*

4 COST-CUTTING SOLUTIONS

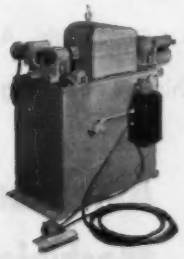
FOR FABRICATORS OF TUBING, PIPE, MOLDINGS AND EXTRUDED SHAPES



PINES 20-TON BENDING PRESS— Speeds production of automotive tail pipes, completes some jobs 50% faster by eliminating work handling. Up to 10 bends produced in a single progressive operation, most jobs completed in one handling.



PINES SEMI-AUTOMATIC BENDER— Capacity up to 300 bends per hour, for applications where output does not require speed of fully automatic machines. Hydraulic power assures accurate, highly uniform results. Economically tooled, easy for women to operate, requires up to 60% less floor space.



PINES END-FINISHING MACHINE—3" capacity, floor-mounted unit with air clamping. Speeds deburring, facing, pointing, or light hollow mill turning. Available with manual or air spindle advance. Other units also provided for smaller and larger work.

PINES SIZE 4 BENDER— Now cold forms ultra-thin 4" x .020" stainless steel tubes for aircraft to 8" c/l radius. Ability to form these sharp, small radius bends without wrinkles saved $14,000 per plane for an aircraft manufacturer.

● Since 1941, when Pines Automatic Hydraulic Bending Machines were first introduced, more and more plants fabricating tubing, pipe, rods, moldings, rolled and extruded shapes, have found it profitable to standardize on Pines Machines. Dependable accuracy, combined with fast, more efficient operation are two of the major reasons why hundreds of commercial and industrial plants have turned to Pines to find cost-cutting solutions to bending and end-finishing problems. A study of the four examples shown here may suggest how you may profitably take advantage of the latest developments in fabricating the "Pines-way".

WRITE FOR *Free* DATA SHEETS

For additional cost-cutting ideas, write today for free copies of "Pines News"—illustrates latest bending and end-finishing techniques applied to actual jobs. And call on Pines engineers for assistance on any job.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery 672 WALNUT • AURORA, ILLINOIS

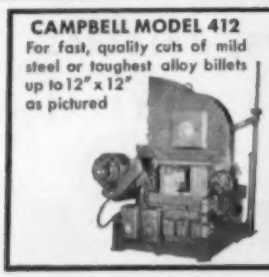
PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

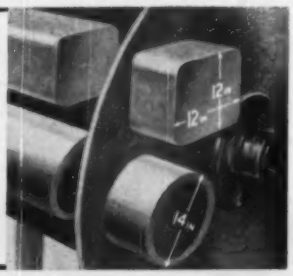
Campbell
Abrasive Cutting Machines

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

CAMPBELL MODEL 412
For fast, quality cuts of mild steel or toughest alloy billets up to 12" x 12" as pictured





Users of Campbell Abrasive Cutting Machines get Tremendous Savings with Fast, Accurate, Quality Cuts of Mild Steel or Toughest Alloys

Write us and we will gladly send you helpful information on the working capacities of the 16 models of CAMPBELL Machines and the CAMPBELL Operating Features that explain the outstanding performance of these machines in cutting a wide variety of shapes and sizes of stock—channels...bars and tubing from the smallest to 14" diameter ...plate up to 4" thick and 20 feet long ...billets up to 12" x 12".

CAMPBELL Machine performance is well illustrated by the **Model 412** pictured above. This machine cuts through 12" x 12" billets of mild steel or toughest alloys (even titanium) in the almost unbelievable time of 6 to 10 seconds per square inch...*with quality cuts.*

Here are some of the operating features that account for comparable speed and quality of cuts by CAMPBELL'S 10 high speed production models...two of them fully automatic for highest production.

Oscillation of the Cutting Wheel to maintain cutting speeds and greatly lengthen wheel life is prescribed by CAMPBELL for all solids cuts over 2" in diameter.

Wet Cutting gives maximum assurance of Quality Cuts.

Ample Power, essential to good performance, is supplied for the Model 412 by a 40 HP motor.

Sound Work Holders—essential to accuracy.

For greatest abrasive cutting accuracy, CAMPBELL provides two oscillating machines that rotate the work—round bars or tubing from 3" to 14" diameter.

For further information write for the illustrated Bulletin DH-460-B

ACCO

Campbell Machine Division • AMERICAN CHAIN & CABLE
923 Connecticut Avenue, Bridgeport 2, Connecticut

DID YOU KNOW

. . . that you will find more advertising for machine tools in *American Machinist* than appears in any other magazine in the world?

All of it will guide you to the best in modern machining methods and equipment. You spend time well when you spend it in the pages of *American Machinist.*

DON'T MISS...

American Machinist's news pages . . . Spot News . . . Washington . . . Detroit . . . Machine Tools . . . for capsulized reports on these vital segments of Metalworking; What's Ahead in Metalworking and Business . . . condensed economic reports to help production planning; Burnham Finney's editorials; News Report, Field Report, and Foreign Report . . . giving you complete news coverage of Metalworking in addition to the up-to-date technical articles and Special Reports on new developments found in every issue. Keep "in the swim" with American Machinist's news pages.

American Machinist
330 W. 42nd St.
New York 36, N. Y.

for efficient, economical **TRIMMING, BLANKING, DRAWING**

choose from these
9 sizes of FERRACUTE
SINGLE-CRANK,
SINGLE-GEARED,
STRAIGHT SIDE PRESSES

75 tons

100 tons

125 tons

150 tons

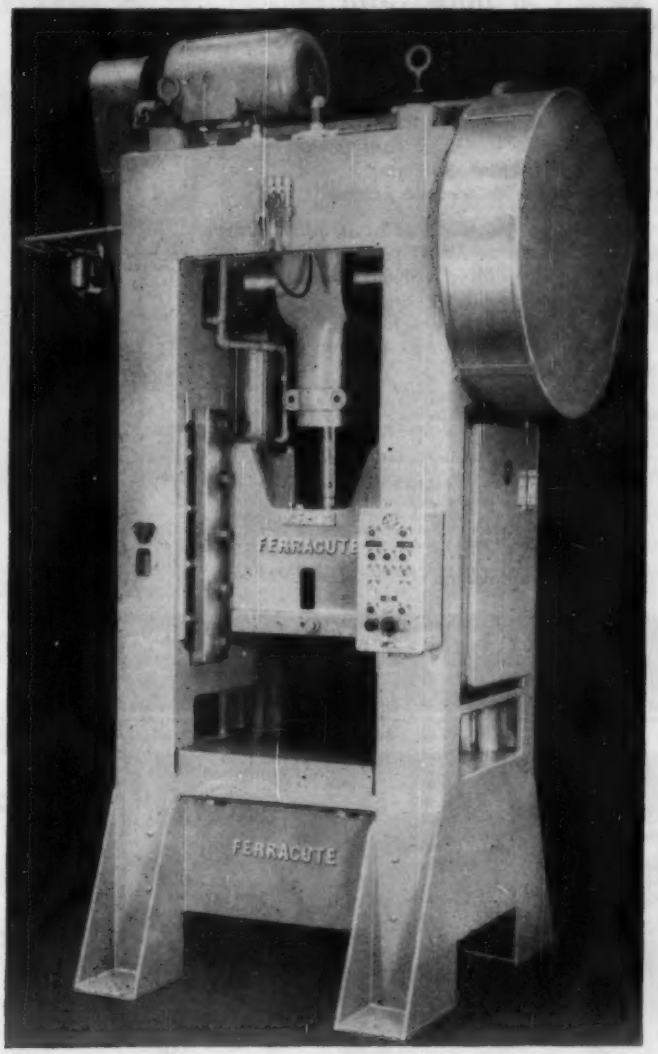
200 tons

250 tons

300 tons

350 tons

400 tons



S-1-150-27-33 150 tons

Also adaptable to bending, blanking, forming, piercing, shearing, and stamping applications. The S-1 presses accommodate practically any automatic or semi-automatic feeds. They have as standard equipment the new Ferracute friction clutch — air powered, electrically controlled — with interconnected brake and single-point adjustment.

For complete specifications and delivery schedules, write today

FERRACUTE MACHINE COMPANY

Since 1862 Builders of Power Presses and Special Machinery

BRIDGETON, NEW JERSEY, U.S.A.

WILLIAMS-WHITE C-FRAME PUNCHES and SHEARS

Custom Built to Your Requirements

- **Bronze bushed main shaft bearings**
- **Anti-Friction flywheel bearings**
- **Renewable liners in ram pocket**
- **Jaw or friction clutches**
- **Footbutton or treadle control**

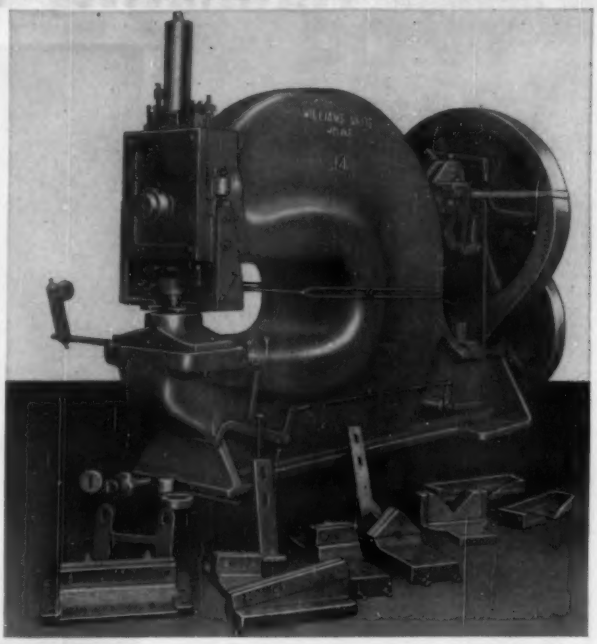
Above are some of the features built into C-frame Punches and Shears by WILLIAMS-WHITE & CO. They are regularly built in various capacities and throat depths, either single or double end and with plain or architectural type tables. Frames may be either cast semi-steel, of box section, or of steel plate, welded construction.

REPRESENTATIVES

CALIFORNIA, Los Angeles: George A. Davies Mach'y Co.
ILLINOIS, Chicago: WILLIAMS-WHITE & CO., 53 W. Jackson Blvd.
MICHIGAN, Detroit: E. E. Wood Mach'y Co.
OHIO, Cincinnati: Columbus or Dayton: Seifreat-Elstad Mach'y Co.
Cleveland: A. L. Bechtel & Son
OREGON, Portland: Allied Northwest Mach. Tool Corp.
PENNSYLVANIA, Pittsburgh: Frank Ryman's Sons
Wynnewood (Phila.): Edw. A. Lynch Mach'y Co.
WASHINGTON, Seattle: Perine Mach'y & Supply Co.
WISCONSIN, Milwaukee: Pagel Mach'y Co.

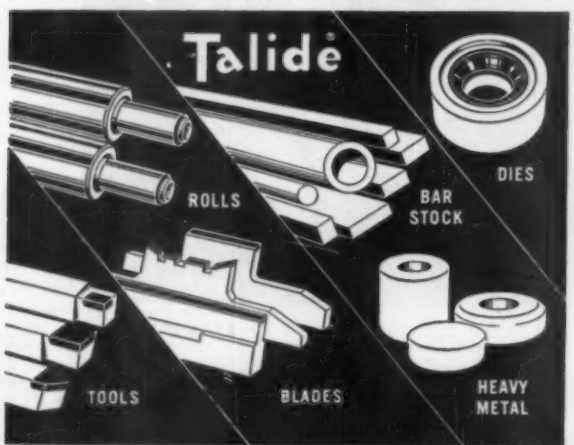
BUILDERS OF MACHINERY SINCE 1854

WILLIAMS-WHITE & Co.
304 EIGHTH ST. • MOLINE, ILLINOIS
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS



- Pictured above is a WILLIAMS-WHITE No. 14, Single End Punch of 100 tons capacity, 36-inch throat, with standard punching, angle, plate and bar shearing tools.

For complete details, ask for Bulletin 74



HARDEST MAN-MADE METAL!

• New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

All about

How to Run An Engine Lathe

Here is a comprehensive *American Machinist* Special Report on one of Metalworking's most useful and versatile machines. Production executives will find this fully illustrated report particularly useful as an aid in training apprentices and new operators of engine lathes.

"How to Run an Engine Lathe" covers in detail the parts of, and operation of the engine lathe. Turning tools and the various turning operations, plus lathe attachments and care, are examined at some length.

Copies of this valuable Special Report are available to you at 25 cents each.

16 pages — 25 cents each

READER SERVICE DEPARTMENT

American Machinist

330 West 42nd Street, New York 36, N. Y.

HOW THREE PHASE RESISTANCE WELDING IS USED TO FABRICATE STRUCTURAL STEEL

Production proves Sciaky techniques of resistance welding provide the consistently safe welds necessary for assembling primary structures.

For over 20 years resistance welding has been used to fabricate metal structures by many European contractors. However, until recently the process has been restricted to relatively light sections.

Structural Steel Fabrication

In Rouen, France, Enterprises Metropolitaines & Coloniales is now successfully resistance welding heavy structural beams into composite strength members.

Figure 1 shows a typical cross section of two "I" beams spot welded together. Figure 2 shows a more elaborate development of the assembly shown in Figure 1. Five "I" beams are welded into one composite strength member.

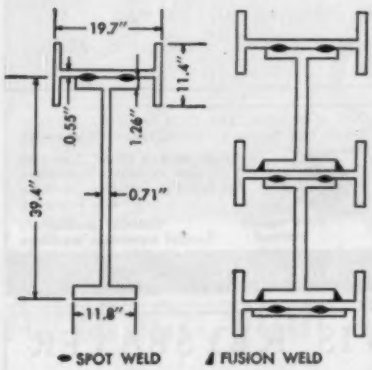


Fig. 1 Fig. 2

A typical beam is almost 69 feet long. It is part of an assembly 131 feet long weighing 45 tons. A total of 182 spot welds in two rows is used to fabricate the structure.

Sequence of Operations

To facilitate production, beam elements to be welded are mounted on an arrangement of two carriages located in front of the welder. One of the carriages is powered and operated by remote control by the single operator (not skilled) who also triggers the weld sequence. Indexing time is 4 seconds.

The welding of the assembly is accomplished in four operations. Operation No. 1 begins in the middle of the column. One row is made to the end and the welder returns to the middle to weld the balance of the row in the other direction. The second row is accomplished in the same manner.

The average time required for each spot weld including indexing is less than 40 seconds. *The entire beam is fabricated in less than two hours including set-up time.*

The Welder

The welder is a Sciaky Patented Three Phase 450 KVA Welder designed to be operated from a cradle or in a suspended position (as shown in the photograph). Power supply is 220 volts. Maximum electrode force is 14 tons. Maximum secondary current is 75,000 amps. Controls are located directly opposite the welder.

The key to successful welding of heavy structural shapes is the Sciaky Patented Three Phase Principle. In addition to its many other advantages it provides the weld quality and consistency essential to primary structure fabrication.

Advantages of Resistance Welding

The use of Sciaky Resistance Welding Techniques results in a substantial saving in material and weight.

It eliminates extra beam size necessary to compensate for the weakening effect of rivet holes. The extra operation and time necessary to drill rivet holes is eliminated. In addition the material and weight contained in rivet heads is eliminated.

Only one worker (not skilled) is needed for the welding operation.

Further Information

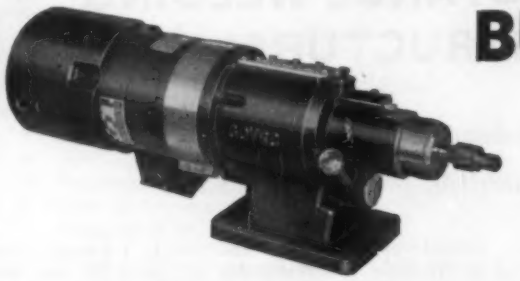
More detailed information on this operation is presented in a twelve page illustrated report. Write for your copy, asking for the *"Resistance Welding at Work Special Report on Fabricating Structural Steel."* There is no obligation.

Fig. 3 View of beam riding on powered dolly as welds are being made by the Sciaky Patented Three Phase Welder.

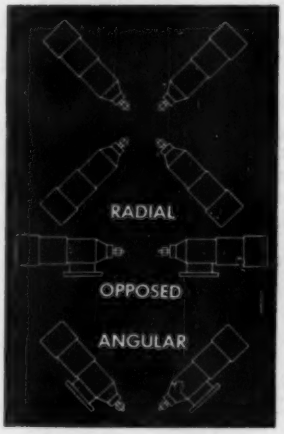
Largest Manufacturers of Resistance Welding Machines in the World

SCIAKY®

Sciaky Bros., Inc., 4933 West 67th Street, Chicago 38, Ill., Portsmouth 7-5600



BUILD YOUR OWN
AUTOMATIC DRILLING OR TAPPING MACHINE



With Govro-Nelson Automatic Drilling and Tapping Units, together with the bases and electrical controls, which we can supply, you can build yourself an automatic drilling or tapping machine at substantially lower cost than a special machine.
Any number of units may be employed. Examples of the various ways in which they may be arranged are shown at the right.

DRILLING UNITS

The Drilling Units are made in several sizes with spindle speeds from 1100 to 3450 RPM. Drill Units have full Hydraulic Control with external adjustment for the rapid approach, the rate of feed and the length of stroke. Suitable for drills up to 3/8", depending on material.

TAPPING UNITS

The Tapping Units are available in two sizes with 550 and 1725 RPM spindle speed. Features include no clutch and no lead screw and automatic adjustment for various leads. Suitable for tapping 0-80 to 3/8-16, depending on material.

Write for Literature

Automatic DRILLING UNIT

GOVRO-NELSON CO.
Machinists of Precision Parts for 34 Years
1933 Antoinette Detroit 8, Mich.

Find out how . . .
Sperry
Hydraulic REMOTE CONTROLS
give you instant, positive . . .

- circular motion
- straight line motion
- multiple control
- geared take-off

accurate manual or automatic control

AM-6
SPERRY PRODUCTS, INC.
1103 Shelter Rock Road
Danbury, Connecticut
☐ Send complete hydraulic control information
☐ Have technical representative call
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES
Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering
CAMS OF ALL TYPES
Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.
Mfrs' agents wanted
Contract production; Special automatic machines
EISLER ENGINEERING CO., INC. | 751 SOUTH 13TH STREET NEWARK 3, N. J.

DAVIS KEYSEATER
This low cost machine will handle internal keyseating jobs up to 1 in.
Write for illustrated bulletin.
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

WAY GUARDS
- KEEP WAYS CLEAN
- SAVE THE MACHINE
- SAVE THE MAN

Made by experienced men to fit your needs.

MADE OF OIL RESISTANT COATED FABRIC
HIGH ABRASION TEST
WRITE FOR DETAILS
CAN-PRO Corporation 36 MCWILLIAMS STREET FOND DU LAC, WISCONSIN

Theoretical graphs developed on double-curved skins for the F8U-1 Crusader predict formability of hard-to-form high-strength materials.

Join Vought's Manufacturing Engineers

Advance your career by mastering new metals

Tough cookies, these metals of tomorrow. Taming them means tough projects for Manufacturing Engineers. But they're the kind of projects you'd like in your record . . . and on your calendar right now.

Research, Methods and Tool Engineers meet and master the newest materials at Chance Vought. From magnesium-thorium through titanium to tool steels . . . they research the high-speed metals field.

Using theory based on mechanical properties, and proved by experiments, they determine whether metals that withstand hypersonic heating can be shaped into parts for Vought fighters and missiles. They design machinery and tooling that will do the job on a production schedule. And they develop techniques that offset the high cost of exotic metals by holding scrap rates and labor costs to practical minimums.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

Your income goes further in Dallas

No state income tax. No local or state sales taxes. Low school and property taxes, and a favorable cost of living. That's Dallas . . . where tax savings offer a better, fuller life.

To arrange a personal interview — or, for a prompt report on our openings in Research, Methods and Tool Engineering — return coupon to:

Mr. Al Sterling
Supervisor, Employment and Placement
Chance Vought Aircraft, Dept. AM-3
Dallas, Texas

I am interested in a detailed report ☐ / personal interview ☐

on opening for_____

Name_____

Address_____

City and State_____

Gaging . . .

the Surplus Machinery Market

•**Number 1 topic** at the Machinery Dealers National Association meeting at Grossinger Country Club, New York, the week of May 20 was the status of Senator Sparkman's small business bill—the one that would give surplus machines the same writeoff privileges as new ones.

Latest word is that the Sparkman bill won't go through as such, but that its provisions, including the all-important used machinery writeoff one, will be incorporated into Eisenhower administration policy sometime next year.

Another hot discussion topic at the MDNA meeting was government leasing of machine tools to private industry. Needless to say, MDNA and the entire surplus machinery industry is dead against wholesale tool leasing at low government rates.

Highlight of the four-day meeting was the election of Elmer W Pfeil of Elmer W Pfeil Inc, Cleveland, as president of the Association, succeeding Austin Lucas of Bridgeport, Conn.

New first vice president is Charles Kempler of Interstate Machinery Co, Chicago; second vice president is Alex Zeeve of Alex Zeeve & Co, New York; and treasurer is Richard Strom of Strom Machinery Corp, Chicago.

Incidentally, MDNA's 100-page directory of member dealers will be ready for distribution soon to industrial customers.

•**There's no getting around it, business is slow**—dead slow—just now. Here's a random sampling of dealer reports:

Dealer No. 1 says the last 30 days have been really bad, and chances of a pickup before fall are remote. This dealer had a lucky break recently when two of his customers launched plantwide modernization programs. That brought his sales to date this year just about even with those of last year, but without that shot-in-the-arm his annual take to date would be way off.

He picked up an interesting bit of information from a buyer for a blue-chip company. This outfit sends the buyer and a superintendent or master mechanic, plus one or two manufacturing engineers to practically all of the big auctions.

Admittedly, the company usually pays more for a machine at auction than it would in a dealer's showroom, but it writes the excess charges and travel expenses off more or less as employee rehabilitation. "Gets their noses away from the grindstone for a while, freshens up their outlook" is the way the company figures it.

Dealer No. 2 says he has sold "practically nothing" so far this year during the second quarter, compared with an excellent second quarter last year. He doesn't look for any pickup at all through the summer, but hopes for a fast comeback in the fall if some of the modernization programs he has been quoting on go through. He's "waiting for the plug to be pulled."

Dealer No. 3 is more resigned to the ups and downs and the feast-or-famine aspects of the used machinery business. Consequently he's pretty optimistic about a strong business pickup early this fall —even though his total sales this year are only a third as big as those for 1956. It's his theory that 1957 may prove to be 1956 turned upside down businesswise. If you remember, last year started out strong for the used machinery dealer, petered out toward the end of the year. Dealer No. 3 thinks that this trend will be reversed to such an extent this year that 1957 business will at least equal 1956's.

United
EVERY TIME!

BORING MILLS
BULLARD 24" New Era—3-Jaw Chuck Table, Vert.
BULLARD 36" Spiral Drive — 3-Jaw Chuck Table, Vert.
BULLARD 42" Spiral Drive, 4-Jaw Chuck Table, Vert.

GEAR EQUIPMENT
BARBER COLEMAN Type S Hobber
GLEASON 8" Straight Bevel Generator
FELLOWS Ext. Spur & Helical Str. Line Generator
FELLOWS 4" Fine Pitch Ext. Spur & Helical Shaver
FELLOWS #61A Int. & Ext. Spur Shaper
FELLOWS 8M Rod Liner Tester
FELLOWS #615A Int. & Ext. Spur & Helical Shaper

SURFACE GRINDERS
ABRASIVE 3B 8" x 24" Hor. Auto.
ARTER A3 12" Rotary
COVEL #20 6 x 18 Hor. Hydr.
DoALL D6 6 x 18 Hor. Hydr.—Selectron —Coolant—1953
NORTON 6 x 18 Hor. Hydr.
NORTON 6 x 18 Vert. Hydr.

ENGINE LATHES
AMERICAN 13" x 30" High Duty 12-Speed
PRATT & WHITNEY Model C 14 x 30 18-Speed
REED PRENTICE Model B 14" x 54" 16-Speed
NEBEL LN 18" x 30" 8-Speed

TURRT LATHES
B & O #2 1" Ram—Bar
B & O #7 2½" Ram—Bar or Chucker
W & S #2 1" Ram—El. Bar Feed
W & S #3 1½" Ram—Chucker
W & S #5 2½" Ram—Bar—Preselect.

MILLERS
B & S #2 Light Type Plain
B & S 3B Standard Plain—Vert. Attach.
VAN NORMAN #22L Plain
VAN NORMAN #22LU Univ. — Div. Heads
CINC. #4 High Power Plain

PRODUCTION MILLERS
CINC. #08 Plain
CINC. #2-24 Plain
CINC. #4-36 Hydromatic—2-Way Cycle
B & S #12-18 El. Control
K & T 12-124 Simplex

PLANERS
GRAY 36" x 36" x 12' Dbl. Housing—1 Rail, 2 Side Heads—1942

PLANER MILLER
INGERSOLL 42" x 42" x 14' Adj. Rail Dbl. Housing — Tubular Ways — 2 Swivel Side, 2 Swivel Rail Heads

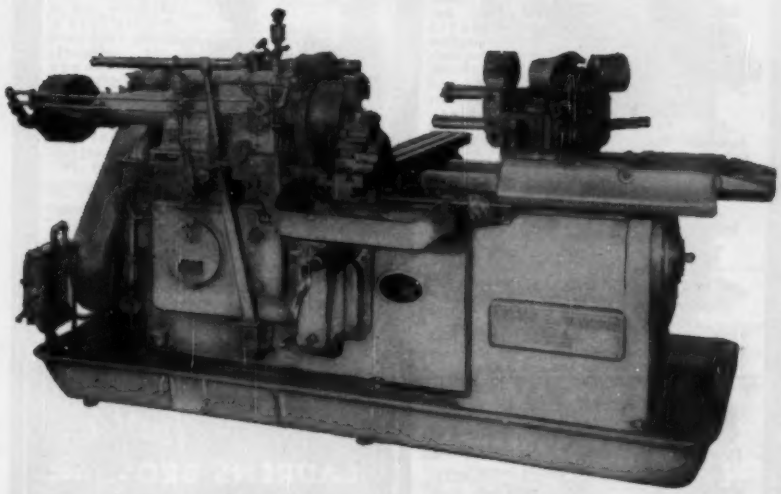
MISCELLANEOUS
WIEDEMANN R41P 12-Ton 18-Station Turret Punch Press
GORTON 8½D Vertical Duplicator — Aluminum Table
PEXTO #155 Multiple Cut Slitter
PRATT & WHITNEY 12B 2-Spindle Vert. Profiler
COLONIAL HAS 3-36 Hydraulic Horizontal Broach

United
MACHINERY & TOOL
CORPORATION
83 THOMAS STREET
WORCESTER 8, MASS.

· RELIABILITY
· QUALITY
· VALUE · · ·

MOREY

FOR HALF A CENTURY



18 late type POTTER & JOHNSTON 4D Automatic Chucking Machines from a government warehouse where they have been stored for the past few years. Machines have seen very little service and are in excellent condition!

RADIAL DRILLS

AMERICAN 3'0" Triple Purpose
AMERICAN 4'11" Triple Purpose
CARLTON 6'19" Plain; low hung drive.
CINCINNATI BICKFORD 2½'7½" "Super-Service"; high speed.
CINCINNATI BICKFORD 4'11" Plain.
CINCINNATI BICKFORD 6'15" Universal.
FOSDICK 6'12"; late type.

GEAR EQUIPMENT—GLEASON

#1 Surface Hardener; late type.
3" Straight Bevel Gear Generator; 4-7/16" P.D., 8 D.P.; late.
3" Spiral Bevel Gear Generator; 4-7/16" P.D.; 12 D.P.; late.
#6 Straight Bevel "Revacycle"; .450 D.P.; late.
#7 Hypoid Cutter Sharpener; max. dia. 6" R or L hand; late.
#11 Straight Bevel Gear Generator; M.D.
#12 Tool Sharpener; late type.
12" Spiral Bevel Cutter Sharpener; max. dia. 16"; late.
#16 Hypoid & Spiral Bevel Gear Generator; 2½ D.P.; late.
#14 Hypoid & Spiral Bevel Gear Grinder; max. dia. 16"; late.
#12B Straight Bevel "Coniflex Type" Gear Generator; 3 D.P.; max. dia. 24"; late.
15" Spiral Cutter Grinder; M.D.
15" Spiral Bevel Gear Generator; max dia. 19¼"; 3 D.P.; M.D.
18" Straight Bevel Gear Generator; 3 D.P.; max. dia. 20"; M.D.
25" Spiral Bevel Gear Generator; max. dia. 34"; 1½ D.P.; M.D.
24" Straight Bevel Gear Planer; max. dia. 28"; 1½" D.P.; M.D.
37" Spur & Straight Bevel Gear Planer; max. dia. 48"; 1 D.P.; M.D.
54" Spur & Straight Bevel Gear Planer; max. dia. 60"; 3½ D.P.; M.D.

GEAR EQUIPMENT—HOBBING

BARBER COLMAN Type A; cap. 12"x12"; 3 D.P.; late type.
BARBER COLMAN Type S Auto., 1" dia., brass 24 D.P. steel 32 D.P.; late.
BARBER COLMAN Type T, 12"x12" cap., 3 D.P.; late.
BARBER COLMAN #17, cap. 8"; 2½ D.P., 5¾" hole thru spdle; M.D.
GOULD & EBERHARDT #8H Univ.; cap. 12"; 4 D.P.; M.D.
GOULD & EBERHARDT #12H Univ.; cap. 12"; 4 D.P.; M.D.
GOULD & EBERHARDT #24H Univ.; cap. 27"; 3½ D.P.; late type.
GOULD & EBERHARDT #24H Univ.; extended hob spindle.
NEWARK #5 for helical, worm wheels & spur gears

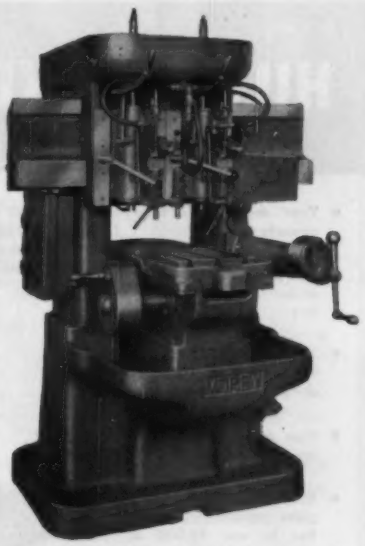
SHAPERS & SLOTTERS

CINCINNATI 20" & 24" Heavy Duty Horiz.
GOULD & EBERHARDT 24" Horiz.; M.D.
GOULD & EBERHARDT 32" "Invincible"; horiz.; M.D.
HENDEY 12" Univ. Horiz.; high speed; late type.
MANVILLE #1 Auto. Screw Slotting; cap. 3/16" dia., 1¼" length; M.D.
NEWTON 15" Ver. Slotter; M.D.
NILES DEMENT POND 30" Slotter; crank type; late.
PRATT & WHITNEY 6" & 10" Ver.; M.D.
ROCKFORD 36" Openside Shaper; Hyd.; M.D.; late type.
POTTER & JOHNSTON 24" Shaper; late.
STEPTOE 14" Horiz.; M.D.

MILLERS—THREAD

EXCELLO #33 Thread Grinder helix angle of wheel 20° in either direction.
EXCELLO #35-L Univ. Precision Thread Grinder; late type.
FELLOWS #4T Thread Generator; cap. 4"x18" centers; 5 D.P.; late type.
HALL Style B Planetary Mill & Thread Mill; max. dia. 9" late.
HANSON & WHITNEY 8"x16" centers Univ.; late type
LANDIS #6 Thread Grinder; 12"x24".
LEES BRADNER Model LT—6"x72" cc; late.
LEES BRADNER Model HT—12"x24" cc; late.
MOREY 12"x30"; 12"x120"; 12"x160"; 12"x190" cc; late type.
PRATT & WHITNEY 4½"x12" cc; late.
PRATT & WHITNEY 6"x132" cc.
WALTHAM—max. center distance 12".

MOREY MODEL 12M DOUBLE SPINDLE VERTICAL PROFILER and MILLING MACHINES



Special opportunity to acquire from the manufacturer *rebuilt profilers with manufacturer's new machine guarantee* at a very substantial saving. 12 of these machines while they last!

A thousand and one varieties for your every Machine Tool need!

MOREY *for machine tools!*

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
383 LAFAYETTE STREET • NEW YORK 3, N.Y.
ALGONQUIN 4-6560 • CABLE ADDRESS: WOODWORK N. Y.

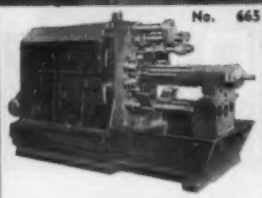
LAURENS

means dependable, technical knowledge, and courteous service to plants all over the World. We guarantee EVERY machine we sell. This means that we are doubly careful about what we ship to you.

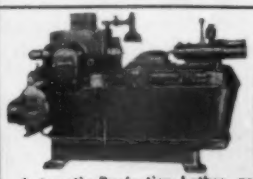
No. 521 Heald Single End Boramatic, new about 1950, 16" table travel, like new.

No. 122 Heald Double End Boramatic, serial number 35198, new in 1954, practically new. With one head on each bridge and hydraulic cross sliding fixture.

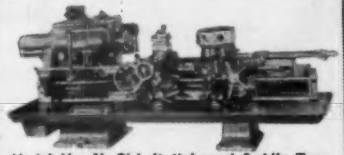
#76H Baird 6-Spindle, 7" capacity Automatic Chucker, serial 473, latest style, new 1947. Fully equipped and tooled.



No. 665 New Britain Gridley Chucker 6-Spindle, 6½" capacity, new 1945, serial 29479. tooling. Similar to picture.



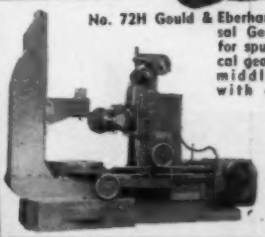
#10 Sundstrand Automatic Production Lathes, serials 10-490, 10-534 and 10-538. Late machines. No. 12 Automatic Production Lathes, new 1949, serials 82-678 and 82-662.



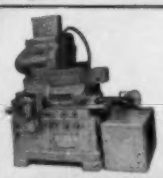
Model No. 1L Gisholt Universal Saddle Type Turret Lathe, serial 632-35, 1942, complete bar feeding mechanism and collet chuck.

12" 8-Spindle Bullard, Model "D" Mult-Au-Matic, Serial 19002, new 1942, double index, power chucking. With four plain slides and two double compound slides.

Fellows Gear Shapers: Models 61, 61A, 75 and 715 Fellows Gear Shapers. These are of the latest type, equipped, standard, excellent condition throughout. Ask for detailed quotations.



No. 72H Gould & Eberhardt Universal Gear Hobber, for spur and helical gears. New in middle 1930's, with outboard support, change gears, motor. Max. dia. of gear without outboard support 78".



Two—#261 Heald Precision Rotary Surface Grinders, serials 33579. New in 1953. 12" diameter magnetic chucks. For grinding flat, concave and convex surfaces.

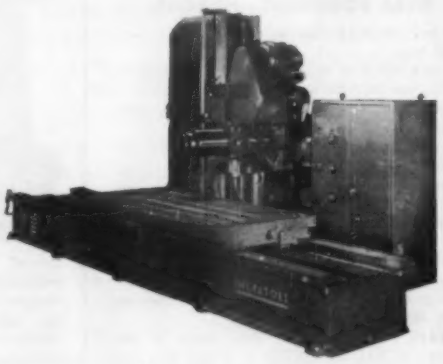
Tools
LAURENS BROS., INC.
Machine
2780 HIGHLAND AVE. Norwood
CINCINNATI 12, OHIO
Phone REdwood 1-3500

HILL-CLARKE

BEST BUY OF THE MONTH

- Your machine is ready to operate upon arrival.
- You can inspect the machine under power before you buy.
- You get detailed, accurate information on every machine.
- You are protected by an unrestricted guarantee.
- You benefit from the complete remanufacturing facilities in our 58,000 sq. ft. plant.
- You can buy with confidence in our 90 years experience in the machinery business.

54"x60"x8' INGERSOLL Horizontal Spindle Openside Milling Machine, 15 H.P. spindle motor, AC and DC feed and rapid traverse motors, 14½" dia. quill, 7" Spindle, New '42, $21,000.



Ask for Complete Listings

HILL-CLARKE MACHINERY COMPANY
PHONE: CRawford 7-2000
2106 S. KILBOURN AVE., CHICAGO 23, ILL.

IMMEDIATE DELIVERY
BRAND NEW
CYRIL BATH
(STURDYBENDER)

POWER PRESS BRAKES

#100- 8	8' x 3/16"	10' Bed
#100-10	10' x 8 GA.	12' Bed
#120-10	10' x 3/16"	12' Bed
#150- 8	8' x 5/16"	10' Bed
#150-10	10' x 1/4"	12' Bed

Purchasers of Cyril Bath Brakes are entitled to services of a factory representative to assist and supervise installation, and instruct personnel in operation and maintenance. NO CHARGE FOR THIS SERVICE.

PRESS & SHEAR MACHINERY CORP.

2600 EAST TIOGA STREET
PHILADELPHIA 34, PA.
GArfield 6-8840

These Brakes are available for lease with option to purchase, or will finance over long term.

BUY FROM STOCK
Telephone
BAKER 5-5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing. Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 3, No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

No. 1L, 2L, 3L GISHOLT Univ. Turret Lathe, Cross Sliding Turret, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

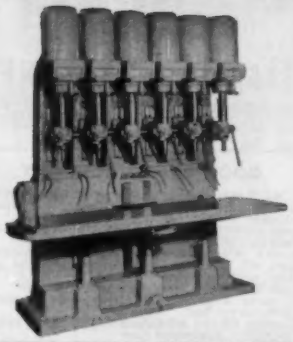
3', 5', 6' CINCINNATI BICKFORD Radial.

3' x 13" Col. CINC-BICKFORD "Super Service" Radial Drill.

MILLS

No. 0-2 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 34-36, 45-48, 48" Cincinnati Duplex Mills. Late Type.



6 Spindle LELAND GIFFORD No. 2LMS-20" Drill Press. Excellent Condition.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D. Late

No. 2, No. 3, 4 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 2, No. 3 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

No. 4 CINCINNATI Hi Power Vert. Mill, 1942.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Drives.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 13' to End Support, M.D.

3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

No. 18, 19, 20, 21 Bliss O.B.I. Press.

GRINDERS

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, MD, Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

No. 175 SCHMIDT M.D. Hyd. Power Marking Machine, Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

20" ROCKFORD Model SA Hydraulic Vertical Slotter, New 1953.

8" CLEVELAND Model A Automatic Screw Machine. Late Type.

No. 9 MARVEL Heavy-Duty Hack Saw 10" x 10" Cap. M.D. Late Type.

6' x 10 ga. Parker Power Squaring Shear, M.D. Late Type.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

MULTIPLE SPINDLE DRILLS

No. 3 Baush, m.d., 16x30" head
3 spindles 28" Cincinnati-Bickford Upright Drill, m.d., No. 4 M.T.
No. 924 Barnes Vertical Drilling, Boring, Facing & Reaming Machine
6 spindle W.F. & John Barnes Vertical Drilling Machine, m.d.
3 spindle Rockford 12" Gang Drill, m.d.
4 spindle No. 201—¼" Barnes, H.D., m.d.
2 spindle Moline Adjustable Rail
6 spindle Model M1613 Pratt & Whitney In Line Vertical Drill

UPRIGHT DRILLS

20" Barnes All Geared Self-Oiling Drill & Tapper, m.d.
20" Cincinnati-Bickford Super-Service Prod. Drill, m.d.
21" Cincinnati-Bickford, single spindle, m.d.
24" Barnes Camel Back, m.d.
25" Cleveman, single spindle, m.d.
No. 2AL Natco Holestool Vertical, m.d.
No. 2 Colburn Mfg. Type, m.d.
No. 4—48" Defiance Machine Co., Drill, m.d.
No. 150 Baker Single spindle, m.d.
No. 201—¼" Barnes Single Sp. Self-Oiling All Geared Drill & Tapper, m.d.
No. 242 Barnes Single Sp. Self-Oiling All Geared Drill & Tapper
No. H-4 Barnes Hydram, m.d.
No. 25 Foote-Burt, m.d., Heavy Duty

GEAR SHAPERS

Type Z Fellows Horizontal, m.d.
No. 4 Fellows Enveloping Gear Generator, m.d.
No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows Gear Shaper, belted m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 8I Fellows, belted m.d.
No. 6I Fellows, gear box, m.d.
No. 61A Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 624A3 Fellows, m.d.
No. 645A Fellows, m.d.
No. 645A3 Fellows, vee belt drive
No. 645Y Fellows, m.d.
No. 70 Cross Deburring Machine, m.d., 1940
No. 72 Fellows H.S. Spur Gear Shaper, m.d.
No. 73 Fellows H.S., m.d.
No. 75A Fellows, H.S. Spur & Helical Gear Shaper, m.d.
No. 712 Fellows, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
No. 13LS Fellows Gear Lapper, m.d.
No. 12LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG3I Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
15" National Broach Red Ring Gear Lapper, m.d.
10" Pratt & Whitney Model M1639 Single Wheel Gear Grinder Machine, m.d.
18" National Broach Red Ring Gear Lapper, m.d., late

GEAR CUTTERS

No. 12 Gleason Straight Tooth Bevel Gear Rougher, m.d.
No. 12 Gleason Straight Tooth Bevel Gear Rougher, & Finisher, m.d.
No. 36 Gould & Eberhardt Bevel & Spur Gear Rougher, m.d.
No. 36 Cross Gear Tooth Rounder, m.d.
No. 36BM Gould & Eberhardt Spur Gear Cutter
No. 50 Cross Clutch Miller, m.d.
No. 605M Gould & Eberhardt, 3 spindle Vertical Gear Cutter, Roughing, & Finishing, External Spur gears only
No. 4B Fellows Gear Burnisher
No. 6B Fellows Gear Burnisher
3" Gleason Gear Generator, m.d.
8" Gleason Gear Generator, m.d.
11" Gleason Gear Generator, m.d.
No. 5AC Loss-Bradnar Heavy Type Gear Generator, m.d.
No. 4—48" Brown & Sharpe Spur Gear Cutter, belt
No. 4—48" Brown & Sharpe, m.d.

GEAR HOBBING MACHINES

No. 3 Barber-Colman, m.d. in base
Type A Barber Colman, m.d.
No. 1 Loss-Bradnar Universal, m.d.
No. 12 Barber-Colman, Double Overarm, m.d.
No. 12 Barber-Colman, Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d. Spur & Spiral
No. 13D Cleveland Rigid Hobber
No. 12H Gould & Eberhardt Universal Mfg. Gear Hobber, m.d.

GEAR TESTERS

Type 8M Fellows Red Liner, m.d.
FPV-60 Maag Gear Wheel Co. Profile Testing Instrument
12" National Broach & Machine Co.
18" National Broach & Machine Co.
16" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Heb, Reamer & Gear Checker
National Broach & Machine Co. "Red Ring" Universal Gear Checker

AUTOMOTIVE GRINDERS

No. 76 Van Norman Automatic Piston Turning & Grinding Machines, m.d.
Kwik-Way Model H Piston Turning & Grinding Machine, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.

CARBIDE GRINDERS

No. 48C Excello Carboloy, m.d.
No. 49 Excello H.D. Carbide Grinder, m.d.

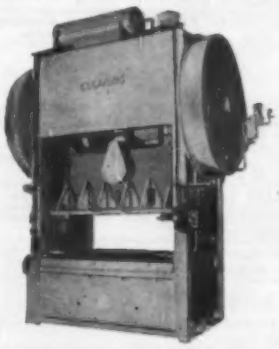
CRANKSHAFT GRINDERS

18x66" Landis Universal Type C, m.d., late
22x72 Landis Type CH, m.d., late

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
7004 Tennyson Avenue, Cincinnati 29, Ohio
MElrose 1-1241 "TWX" CI-174
CABLE ADDRESS
EMCO

WORLD'S LARGEST STOCK
STAMPING PRESSES
BLISS • CLEARING • CLEVELAND
FERRACUTE • HAMILTON • L & J
NIAGARA • TOLEDO • V & O



SQUARING SHEARS • PRESS BRAKES
REBUILT *and* GUARANTEED

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34 PA. Phone GArfield 3-8700

McDONALD
USED MACHINERY

New Britain Model 16 Auto. Chucker 8-Sp.
Brown & Sharpe No. 2 Surf. Grinder All Motorized
G&L 3" Bar Table Type Horiz. Boring Mill
Colburn 2-Spindle Bar Col. Heavy Drill M.D. 20"
Niles (Timesaver Model) 52"x14' Bed Grd. Hd. M.D. Lathe 7' Centers.
Niagara 4' Power Shear ½" Cap. 20" Gap
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 9 Rest. Overarm Grd. Hd. Plain Horiz. Miller
Baush 44" Vert. Boring Mill 2 heads.
American Vert. Hyd. Broach 48" str. 15 ton cap. 1947
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 18"x96" Plain xt. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W&S No. 2-A Grd. Hd. Univ. Turret Lathe
Bliss 200 T Cap. S.S.S.C.B. Grd Press 8" Str. #77
Rivett No. 104 A.C. M.D. Internal Grinder, 1942.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers.
Cincinnati 30"x30"x10" D.H. Planer 2 Hds. Box
Amer. 6" Radial Encl. Hd. 10" Col. 32-Sp. Speeds.
Amer. 4 Radial 12" Col. Encl. Hd.
Bliss #6N SC. Stiles Type Press
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
B&S #2A Grd. Hd. Horiz. Univ. Miller.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 20" chuck.
Sundstrand 4-Sp. Vert. Rigidmilt.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Handey 18"x8' bed Q.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Typ.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kompomith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.

MDNA MEMBER

Cincinnati #2, #3, & #4 Centerless Grinders, all Motor Driven.
Bullard 24" Vert. Turret Lathe.
Lynd-Farquhar 20" stroke open-side Shaper Planer.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

BENNETT MACHINERY CO.

BORING MILLS, 4" Sellers, Tble Type, Late
3" bar Yoder, Table Type, 1944
10' Niles Vertical, 2 Hds. M.D.
30" & 24 Bullards, New Era Type
5" Sellers Tble Type, Late
GRINDERS, No. 30 Hanchett Vert. Rotary, 44
36" x 42" P. & W. Vert. Surf., '47
60" Hanchett Vert. Spin. Surf., No. 300
10" x 20" B. & S. No. 1 Univ., 1942
LATHES, 30" x 21' con. N.B.P. Grd. Hd., T.A.,
25" x 48" con. LoBlond, 31" sw., '41
16" x 78" con. Sidney, T.A., 18½" sw., 1952
TURRETS, Nos. 2L, 5 & 3 Gisholts, Late
Nos. 2 W. & S. & 2 & 2G Mercys, Late
MILLERS, No. 2A B. & S. Univ. Tim.
No. 4B K. & T. Vert., Table 102" x 10" oversize
RADIAL DRILLS, 8'10" col. Carlton, M.D.

375 Allwood Rd., Clifton, New Jersey
Phone: PIeasant 9-2966 N. Y. Phone: LOngacre 3-1222

HB MACHINE TOOLS *Serving the World's Largest Manufacturers*

NEW - USED REBUILT MACHINERY

(3) No. 84 Fellows Gear shaper 36" Serials #22126—19716.
36" Hanchett Vertical Spindle Surface Grinder Serial 38-133.
18" x 60" Centers Pratt & Whitney Lathe Ser. #687.
Late Type No. 2 Cincinnati Dial Type Universal High Speed Miller Serial 4A2UIP-55.

HAZARD BROWNELL MACHINE TOOLS INC.
350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-8880

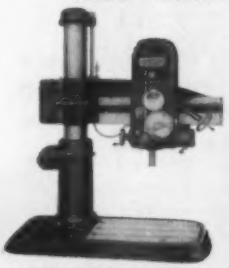
GOOD USED MACHINERY

1½" No. 2 Whitman Swiss type precision automatic
1⅝" No. 61 New Britain 6 spindle automatic chucker
Model 6DREL Potter & Johnston single spindle manufacturing automatic
No. 47A Heald borematic, single end, precision
Model 420 W. F. & John Barnes horizontal deep hole drill and borer
Model B2F1 Natco deep hole horizontal drill
24" swing Allen No. 3 three spindle production drill, power feed
14" swing No. 2 LMS Leland Gifford single spindle hydraulic, woodpecker feed
24" Cincinnati Bickford 4 spindle box column, power feed
No. 96 H.D. Baker Bros. vertical hydraulic feed drill and borer
No. 72A Heald Sizematic internal, swiveling headstock
No. 72A5 Heald Universal internal grinder, cross sliding headstock
No. 4 Gallmeyer & Livingston universal tool and cutter grinder, late
Type HRS Barber Colman hob cutter and reamer sharpener
6" x 72" Thompson round broach grinder
72" Colonial flat broach grinder
No. 521-2 Micromatic lapper
No. 2 Cincinnati centerless lapper
No. 9 WSL Reid automatic lathe
Nos. 8 and 12 Gisholt hydraulic automatic Timken bearing
Model 3D Gisholt simplimatic automatic platen type
No. 2A Warner & Swasey universal Timken bearing turret lathe
Nos. 3 and 5 Gisholt ram type universal turret lathes
2-24 Cincinnati automatic simplex production mills
3" bar Universal Tri-Way horizontal boring, milling and drilling machine
4" bar Universal Tri-Way horizontal boring, milling and drilling machine
32" Gisholt vertical boring and turning mill

WRITE FOR STOCK LIST

MILES MACHINERY COMPANY
2039 E. Genesee St., Saginaw, Mich.
Telephone PL 2-3105

Cimco
SELECT MACHINE TOOLS



3'11" column American Holewizard Radial Drill, motor on head, 12 speeds, late type.

4'11" column American Holewizard Radial Drills, motor on head, 12 speeds, late type.

You'll find what you want . . . in both quantity and quality . . . at Cincinnati Machinery Company, industry leaders in buying, rebuilding, selling and guaranteeing fine surplus metalworking.

Let us quote a firm price on rebuilding any machine tool in your plant.

Cincinnati Machinery
COMPANY, INCORPORATED
3901 Kellogg Ave., Cincinnati 26, Ohio
Phone TRinity 1-0853

CHOICE MACHINE TOOLS

K&T 1404 Prod. Mill 1943
CINN. 1-18 Prod. Mill 1951
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 60 KW, 10,000 cy. 1943
GISHOLT #3 Air Chuck & Cyl. 1943
WARNER & SWASEY 2A Bar Feed 1946
9" AJAX Air Clutch Upsetter, 1947
CINCINNATI 5-54 duplex broach, 1948
LAPOINTE, Vert. Broach 29T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 16x72 Plunge 1948
CINCINNATI 1066 horizontal 2-way, 1946
EXCELLO #35 Thread Grinder 1942
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads, DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.D. 1948
BIGNALL & KEELER 6" pipe threader, 1949
BIGNALL & KEELER 12" pipe threader, 1949
BIRDSBORO hydraulic straightening press, 600 ton, 80x72 bed, 18"stroke, 36" daylight (3) 1942

NOLL EQUIPMENT CO.
4535 St. Clair Ave., Cleveland 3, O.
EXpress 1-0700

PRACTICALLY NEW PRESSES

Warco, cap. 500 tons, bed 180"x84", Double Roll feed. Uncoiler, straightened.
Bliss No. 7-84, cap. 200 ton, Bed 50"x84".
Niagara No. 610, cap. 100 ton, Bed 72"x42".
Bliss No. 5½-48W, cap. 120 ton, Bed 48"x30".
Bliss-Toledo No. 93½J, cap. 140 tons, Bed 108"x 42".
Bliss 93½ H, Bed 84"x36", cap. 140 tons.
Niagara—B6½-72, gap frame bed 72"x30", 6" stroke, air clutch.
Cleveland No. 61D96, cap. 150 ton, Bed 96"x48" str. 8".
Bliss #6½—60, 100 tons, bed 60"x30".
Bliss #90½—60, cap. 525 tons, bed 60"x54".
Machines have Air Clutch and some have Air Cushions and Motor Driven Ram Adjustment.
"If it's machinery; we have it."

NATIONAL MACHINERY EXCHANGE
138 Mott St., N. Y. CAnal 6-2470

IF YOU NEED MONEY

. . . to finance or expand your business; to help you purchase a business; to buy out a partner or majority stockholder; to reorganize your business; or for any other legitimate business purpose, call or write to

L. C. BRAYSON CORP.
1330 Beacon St., Brookline, Mass.
BEacon 2-0547

Used by U. S. Armed Forces
MACHINE TOOL RECONDITIONING
2nd printing
Write for free folder describing illustrated book
MACHINE TOOL PUBLICATIONS
215 Evanevra Bldg., 4th & Wabash Sts.
St. Paul 1, Minn.

HANCHETT KNIFE GRINDER

Model 170C — Serial No. UK241
Type 14D. 170" Blade
Complete with all Electrical Equipt.

PRACTICALLY NEW

SPECIAL OFFERING..$15,000

WINSTON MACHINERY COMPANY INC.
326 West Ohio Street
INDIANAPOLIS 2, INDIANA

EXCELLENT MACHINE TOOLS

4L Gisholt Turret Lathe, 9¼" spindle hole, Serial #967x15, 1940
Gear Rougher, #7 Gleason, 1944
Mill, No. 2 Kempsmith, Universal M.I.B.
Press, Dieing, 60 ton Henry & Wright, late
Turret Lathe, #3 Warner & Swasey, late
Turret Lathe, 4R Gisholt, 9¼" hole, tooling, 1943
28x48x120 Landis Plain Cyl. Hyd. Grinder

WEB MACHINERY CO.
622 W. Eighth St., Jamestown, N. Y.
Phone: 8935

FOR SALE
HENRY & WRIGHT DIEING PRESS
100 Ton, with Roll Feeds and Scrap Cutter. 1946 machine. Avail. crated London. Any Inspection.
STRAIGHT & VINES LTD.
Mint Street, London S.E.1.
England. Cables. Cirrose. London.

FOR SALE
600 Ton Hobbing Press Self-Contained $2150.00
300 Ton Hobbing Press Self-Contained $2450.00
3½ Oz. Injection Molding Machine New
12 x 12 Hand Operated Hot Plate Presses 30 Ton Capacity
CLIFTON HYDRAULIC PRESS CO.
280 Alrood Rd. Clifton, New Jersey

No. 5—90 x 4' Cin. Press Brake, NEW.
Hardinge H.C.T. Chuckers, older.
Fellows Str. Line Gear Generators.
No. 25—10 x 10' Cinn. Shear, 1937.
D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

SPECIAL SERVICE

Time Study Boards, Stop-Watches, Slide Rules, pedometers, counters, etc. Observation sheets in stock. Write for Free Sample Kit. O. P. Co., 5544 So. Homan, Chicago 29, Ill.

DON'T FORGET

the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

SEARCHLIGHT
EQUIPMENT SPOTTING
SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and rebuilt metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the Searchlight pages. A 5-minute study may locate the equipment now.

Second, send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead to

SEARCHLIGHT EQUIPMENT SPOTTING SERVICE

American Machinist
Classified Advertising Division
P.O. Box 12, N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the surplus equipment dealers. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

Please help us locate the following equipment:

_____

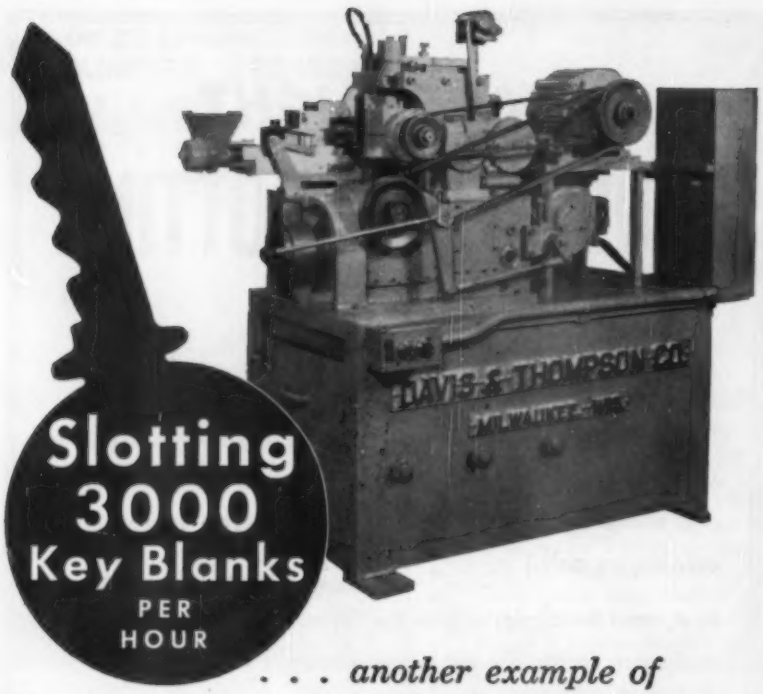
_____

_____

NAME_____ TITLE_____

COMPANY_____ STREET_____

CITY_____ ZONE_____ STATE_____



. . . another example of
Davis & Thompson Production Engineering

If you need high production in milling, drilling, boring and similar metalworking operations . . . with a minimum of equipment and capital expenditure, call in a Davis and Thompson Representative.

This key blank slotting machine is only one of countless machining problems solved by D & T Engineers.

Space does not permit describing this machine in full detail, but if you would like complete details, write.

ADDITIONAL INFORMATION

Get the complete story of the facilities available from Davis and Thompson. Write for this 8-page bulletin today. Ask for Bulletin 1002.

Roto-Matic

Davis and Thompson Co.

4480 N. 124th ST. MILWAUKEE 10, WISCONSIN

DESPERATE . . .

for machine tools?

Good buys in used and rebuilt machine tools are made available to you through the . . . SEARCHLIGHT SECTION

See "Index to Advertisers" for location of section

Index of PRODUCTS ADVERTISED In This Issue

Abrasives, Coated 51
Abrasives (Not Bonded) 72
Accessories & Attachments (Machine Tool) 72D, 191, 260, 292, 322

Bearings .....4th Cover, 184B, 227, 267, 295
Bending Machines 317
Boring, Drilling & Milling Machines (Horizontal) ..28-29, Insert Bet. 32-33, 247
Boring Machines, Internal ....2nd Cover, 106
Boring & Turning Machines (Vertical) .....Insert Bet. 32-33, Insert Facing 184
Broaching Machines 26-27, 94-95, 96-97, 286-287

Cams 322
Castings 57
Centrifugal Machines 312
Chucks ..... 64, 187, Insert Facing 249, 277
Cleaning & Drying Machines & Supplies 266, 312
Collets 64, 294
Compressors, Air 246, 316
Controls, Electrical 185, 281
Counters 32
Cut-Off Machines 285
Cutters, Abrasive 318

Diamond Wheels 264
Die Sets 261
Drilling Machines .....Insert Bet. 32-33, 36, 55, 58, 68-69, 99, 238-239, 282, 293, 304, 309, 311, 322
Drill Jig Bushings 227
Duplicators & Pantographs.....52-53
Dust Collectors 248

Electrical Parts & Equipment 82, 88, 216
Engineering & Production Services..290
Exhibits 284

Fasteners 33, 54, 65, 80, 305
Files, Hand 70-71

Gages, Instruments & Testing Equipment 74-75, 86, 102-103, 112-113, 211, 221, 232-233, 260, 275, 290, 306, 310, 312, 316, 333, 339

Index of PRODUCTS ADVERTISED

In This Issue

Gear Cutting Machines 3, 6-7, 38-39, 83, 85, 312

Gears, Speed Reducers, Motor Reducers 76, 256, 270, 308

Gear Testers 3, 6-7

Grinders—Cutter & Tool 45, 258, 337

Grinding Machines—Production 8-9, 12-13, 16-17, 18-19, 21, 46, 62, 79, 83, 85, 210, 216A, 222, 340

Grinding Wheels .....42-43, 59, Insert Bet. 64-65, 93, 264, 268

Heads: Drilling, Grinding & Tapping .....Insert Bet. 32-33, 216D

Heat Treating Equipment & Supplies 63, 217. 224-225, 307

Honing Machines 214-215

Hydraulic & Pneumatic Parts & Equipment 117, 245, 270, 322

Jig Borers 56, 62, 199, 208-209, 240-241, 270

Jigs & Fixtures 64, 290

Keyseaters 230, 322, 334

Lapping Machines 197

Lathes, Automatic 81

Lathes, Engines 24-25, 47, 52-53, 60, 161, 207, 272, 309

Lathes, Turret .....22-23, Insert Bet. 32-33, 90-91

Lubricants, Cutting Fluids, Quenching Oils & Solvents.....14-15, 114, 250-251, 279, 283

Marking Machines, Tools & Supplies 100

Materials, Cutting & Forming 37, 102-103, 168, 191, 236-237, 292, 315, 320, 335

Materials of Manufacture 20, 34-35, 44, 84, 102-103, 118, 166, 168, 203, 227, 231, 234-235, 242, 263, 301, 306

Materials Handling Equipment 72A, 219

Millers, Die Sinkers, Profilers .....4-5, Insert Bet. 32-33, 94-95, 189, 254-255, 288-289

Motors, Electrical .....Insert Bet. 72A-72D, 110, 195, Insert Bet. 216A-216D, 259, 291

Oil Purifiers 298

(Continued on page 332)

WALTER P. HILL

AUTOMATED
DOUBLE-END MACHINES
REALLY CUT COSTS

New Double-End Machine for Long Parts. Machines both ends of 3/8-in. dia, 15-ft Long Tubing at 4,000 Pieces per Hour.

Hill automated double-end machines produce precision parts at high production rates.

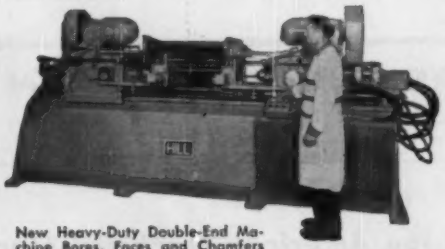
Providing maximum flexibility of part length and diameter, these versatile hydraulic-powered automatic machines utilize magazine feeds. Adjustments for part length changes can be made quickly without altering the magazines.

They will perform precision boring, threading, chamfering, facing and turning operations to 0.001-in. tolerances on solid or tubular round parts. Power heads that develop up to 20-tons thrust force have hollow quills that permit gun drilling at feeds up to 30-ipm with pressurized coolant.

With the head motors stopped, the machines will operate as forming presses that will expand, reduce, flare or bead both ends of tubular parts.

Accurate concentricity of machining and forming operations is assured by boring chucking surfaces with the machine heads.

Send part specifications and production requirements for prompt quotations on cost-saving machines.



New Heavy-Duty Double-End Machine Bores, Faces and Chamfers 30-in. Long, 2-in. dia Steering Columns at 950 Pieces per Hour.

Write for this catalog giving complete information on Hill specialized hydraulic bending machines, double-end machines and extrusion equipment.

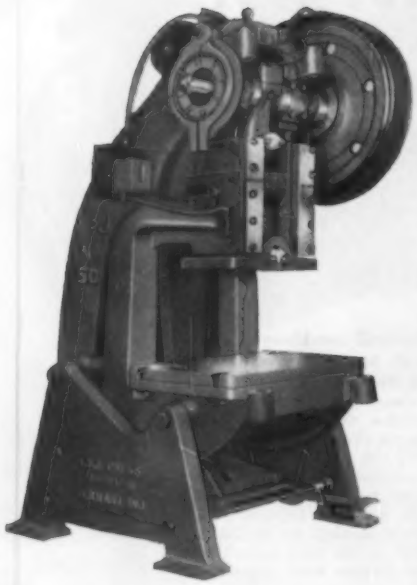
WALTER P. HILL

WALTER P. HILL, INC.

22183 Telegraph Road • Detroit 19, Michigan

L&J 50 SERIES

EXTRA CAPACITY WITH PRECISION TO MATCH



Large area dies are no problem when you have an L&J No. 50 Series press with its extra capacity. The exceptionally heavy frame provides maximum rigidity which enables the flanged, box-type ram to maintain precision alignment for precision jobs. The large work area will permit you to run a greater variety of work. Its dependability and tooling ease provide a new high in press efficiency.

Available in geared and non-geared models. Air clutch is available. It will pay you to get complete details now.

SPECIFICATIONS

Capacity: *Model 50*—50 tons, *Model 50B*—56 tons. **Shut Height:** 10" to 25". **Ram Stroke:** 3" to 8". **Ram Adjustment:** 3". **Ram Face:** 24" x 12". **Bolster Plate:** 36" x 24" x 2¼". **Throat Depth:** 12½". **Opening Thru Back:** 22". **Speed:** *Model 50* Non-geared—100 S.P.M., Geared—50 S.P.M. *Model 50B* Non-geared—95 S.P.M. Geared—46 S.P.M. *Higher speeds with air clutch.*

Write for Bulletin L-14

Describes L&J O.B.I. Presses. 23 Models, 14 to 90 tons, geared and non-geared. Also, 20 to 50 ton Double Crank, High Speed, Straight Side Presses.

L&J PRESS CORPORATION

1629 STERLING AVENUE, ELKHART, INDIANA

From the *American Machinist* Library of *Tips for Top Shop Men*

ONLY two of your possessions increase in value proportionally with price inflation. One is time, the other knowledge. You can employ both productively to build security, or squander them.

Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 331)

Planers ..... Insert Bet. 32-33
Power Transmission 220
Presses, Forging & Forming Equipment & Supplies 66-67, 78, 87, 89, 104, 162, 164, 212-213, 226, 249, 257, 258, 262, 274, 284, 299, 300, 302, 319, 320, 332
Production, Inventory & Tool Control 243
Pumps, Circulating 230

Riveting Machines 117, 312
Rust Preventives 265

Saw Blades 48, 70-71, 193, 244
Sawing Machines 48, 210, 290, 314
Screwdriving & Nutrunning Machines 218, 278
Screw Machines; Chucking Machines 49, 73, 252, 303
Shapers & Slotters 120,330
Special Machine Tools 30-31, 50, 223, 228, 254-255, 273, 280, 290, 298, 303, 331, 337
Spindles, Machine 205
Steel Blue 290

Tapping Attachments 294
Tapping Machines ..... Insert Bet. 32-33, 36, 58, 238-239, 282, 322, 336
Thread Cutting Machines 92
Thread Rolling Machines & Tools 10-11, 101, 237
Tooling Set up Equipment 311
Tools, Cutting ..... 3rd Cover, Insert Bet. 32-33, 38-39, 40-41, 61, 77, Insert Bet. 88-89, 96-97, 98, 108, 191, 201, 236-237, Insert Facing 248, 253, 271, 286-287, 292, 308, 315, 320, 339
Tools, Hand 72D, 229
Tools, Measuring 102-103
Tools, Portable 278

Used & Surplus Equipment 324-329

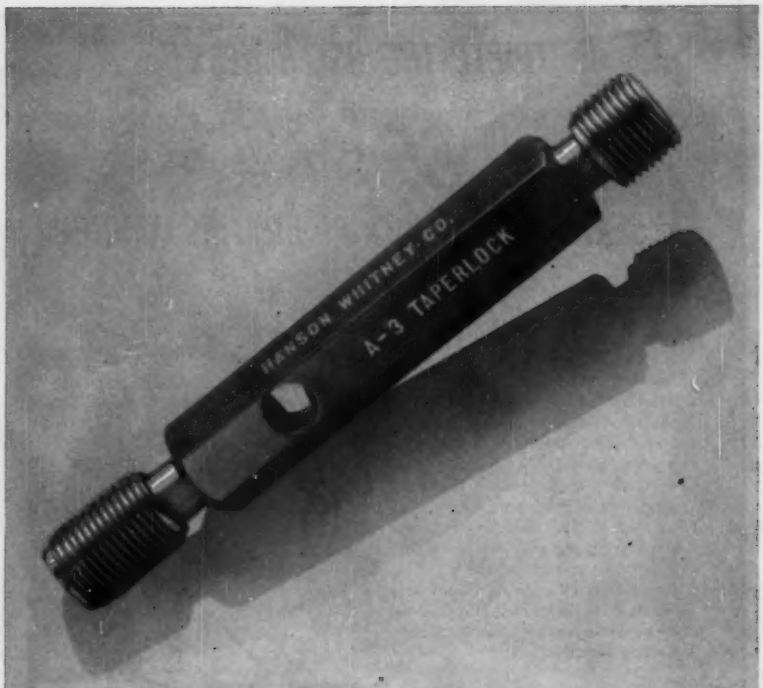
Welding & Cutting Equipment Supplies 164, 269, 276, 321, 338
Wipers, Industrial 313

INDEX TO ADVERTISERS

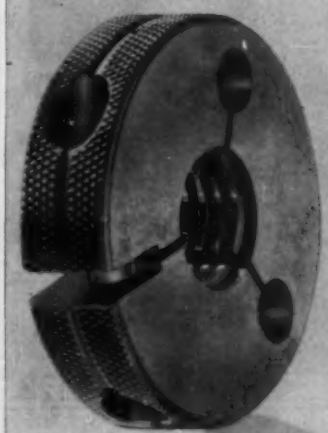
This index is published as a convenience to the readers. Every care is taken to make it accurate, but American Machinist assumes no responsibility for errors or omissions.

	Page
Aaron Machinery Co., Inc.	309
Air-Hydraulics, Inc.	270
Allegheny Ludlum Steel Corp.	315
Allen-Bradley Company	281
Allen Mfg. Company	65
Allis Company, Louis	259
Allis-Chalmers Manufacturing Company	195
Aluminum Company of America	306
American Brass Company	301
American Broach & Machine Co.	96-97
American Chain & Cable Company, Inc.	72A, 306, 318
American Machinist	296-297
American Saw & Mfg. Company	244
American Schiess Corp.	247
American Sip Corporation	199
American Smelting & Refining Co.	57
American Steel & Wire Div.	84
American Tool Works Co.	47
Armco Steel Corporation	118
Armstrong Blum Mfg. Company	48
Armstrong Brothers Tool Company	72D
Arrow Engineering Co., Inc.	288-289
Austin Industrial Corp.	314
Avey Division, Motch & Merryweather Machinery Co.	238-239
Axelson Mfg. Co. Div. of U. S. Industries Inc	272
Baird Machine Company	303
Baker Brothers Inc.	223
Baldwin-Lima-Hamilton Corp.	302
Barber-Colman Company	38-39
Barnes Drill Company	298
Barrett Co., Leon J.	312
Bath & Co., Inc., John	86
Baush Machine Tool Co.	273
Bay State Abrasive Products Co.	42-43
Bay State Tap & Die Co.	108
Bearings Inc.	267
Benchmaster Manufacturing Co.	78
Blake Co., Edward	337
Blanchard Machine Co.	46
Bliss Co., E. W.	299
Bryant Machinery & Engineering Co.	58

(*Continued on page* 334)



GAGES FOR TOP PRODUCTION



Hanson-Whitney has long led the field in the production of top quality Finished Taps, Hobs, Cutters, and Precision Gages. And H-W offers complete stocks and service from local distributors . . . plus home or field engineering assistance on all threading problems.

Hanson-Whitney Gages are engineered and manufactured with "single source" reliability and accuracy. H-W Limit Working Plug and Ring Gages are available in all standard sizes, National and Unified, and all special forms. H-W offers AGD Cylindrical and Thread Plug and Ring Gages, straight and tapered thread, in steel and carbide. In addition, H-W manufactures a complete line of comparator type, internal and external thread gages.

Remember, Hanson-Whitney means —Finest quality throughout the product . . . design engineering know-how based on years of experience in your field's requirements. Write for catalogs—full information.

Hanson-Whitney COMPANY

Division of THE WHITNEY CHAIN COMPANY

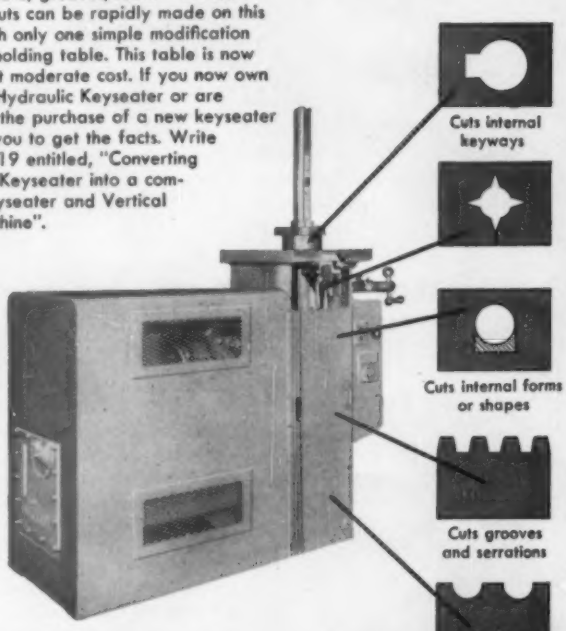
170 BARTHOLOMEW AVE., HARTFORD 2, CONN.

TAPS : THREAD GAGES : HOBS : CENTERING MACHINES : THREAD MILLING MACHINES AND CUTTERS

TRIPLE THE USEFULNESS OF YOUR M&M KEYSEATER AND VERTICAL CUTTING MACHINE

Simple modification greatly increases productive capacity of this versatile machine.

An M & M Hydraulic Keyseater is not only a keyseater that cuts internal keyways up to 5" wide but a vertical cutting machine as well. Serrations, grooves, teeth—a wide variety of cuts can be rapidly made on this machine with only one simple modification — a work-holding table. This table is now available at moderate cost. If you now own an M & M Hydraulic Keyseater or are considering the purchase of a new keyseater it will pay you to get the facts. Write for Bulletin 19 entitled, "Converting the M & M Keyseater into a combination Keyseater and Vertical Cutting Machine".



M&M KEYSEATERS AND VERTICAL CUTTING MACHINES

98

MITTS & MERRILL • 104 Holden Street • SAGINAW, MICHIGAN

WE'VE GOT THE INSIDE DOPE . . .

on the surplus machinery market. To get in on latest developments, read the column . . .

"GAGING THE SURPLUS MACHINERY MARKET"

preceeding the Searchlight Section

INDEX TO ADVERTISERS

(*Continued from page* 333)

	Page
Buck Manufacturing Co.	311
Bullard Co.	Insert Facing 184
Bunting Brass & Bronze Co.	227
Butterfield Div. of Union Twist Drill Co.	77
Cadillac Gage Company	275
Campbell Div. Andrew C., American Chain & Cable Co., Inc.	318
Can-Pro Corporation	322
Capewell Mfg. Co.	193
Card, S. W. Div. Union Twist Drill Co.	61
Carlton Machine Tool Company	55
Chance Vought Aircraft Inc.	323
Chicago-Latrobe Company	201
Chicago Pneumatic Tool Company	278
Cincinnati Bickford Division Giddings & Lewis Machine Tool Co.	Insert Bet. 32-33
Cincinnati Gear Co.	256
Cincinnati Grinders Incorporated	16-17
Cincinnati Lathe & Tool Co.	99
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Grinding Wheels Division	93
Cincinnati Shaper Company	120
Cleereman Machine Tool Corp.	58
Columbia-Geneva Steel Div.	20, 234-235
Columbus Die-Tool & Machine Co.	290
Comtor Co.	290
Cone Automatic Machine Co.	73
Copon Associates Inc.,	265
Copperweld Steel Company	166
Cosa Corporation	304
Crane Packing Co.	197
Crucible Steel Co. of America	44
Curtis Pneumatic Machinery Div. Curtis Mfg. Co.	316
Danly Machine Specialties Inc.,	104
Davis Boring Tool Division Giddings & Lewis Machine Tool Co.	Insert Bet. 32-33
Davis Keyseater Company	322
Davis & Thompson Co.	330
Dearborn Gage Co. Air Gage Division	221
Detroit Broach & Machine Company	286-287
Detroit Die Set Corp.	261
DeVilbiss Company	246
DeVlieg Machine Company	208-209
DoAll Company	210
Dreis & Krump Manufacturing Co.	226
Dykem Company	290

INDEX TO ADVERTISERS

	Page
Eastman Kodak Co., Apparatus and Optical Div.	211
Eisler Engineering Co., Inc.	322
Ellstrom Standards Div. Dearborn Gage Company	221
Engelberg Huller Company Inc.	222
European Machine Tool Exhibition, 5th	284
Ex-Cell-O Corporation	50, 106
Farquhar, A. B. Div. Oliver Corp.	249
Federal Machine & Welder Co.	300
Federal Products Corp.	74-75
Fellows Gear Shaper Company	6-7
Ferracute Machine Company	319
Fosdick Machine Tool Company	68-69
Gear Grinding Machine Co.	83, 85
Gear Specialties, Inc.	76
General Electric Apparatus Dept.	63, Insert Bet. 72A-72D, 82
G. & L. Hypro Division Giddings & Lewis Machine Tool Co.	Insert Bet. 32-33
Gisholt Machine Company	90-91
Gleason Works	3
Goss & DeLeeuw Machine Company	252
Govro-Nelson Co.	322
Grant Gear Works Inc.	270
Grant Mfg. & Machine Company	312
Gray Co., G. A.	28-29
Greenfield Tap & Die Corp.	Insert Facing 248
Gulf Oil Corporation	14-15
Hamilton Division Baldwin-Lima-Hamilton Corp.	302
Hamilton Tool Company	336
Hannifin Corp.	258
Hanson-Whitney Company Division of Whitney Chain Company	333
Hardinge Brothers, Inc.	64
Heald Machine Company Sub. Cincinnati Milling Machine Co.	2nd Cover
Heller Tool Co. Subsidiary Simonds Saw & Steel Co.	70-71
Hendey Machine Div. of Barber-Colman Co.	60
Hill Acme Company Acme Machine Div.	340
Hill Inc., Walter P.	331
Holcroft & Company	217
Hoover Ball & Bearing Co.	295

(*Continued on page* 336)

Proof of Vulcan Tool Steel Superiority:

Tooling Downtime Reduced PRODUCTION UP 15%!

Vulcan TM-6, "M-2 type" high-speed tool steel, has increased tap life by 15% at Detroit Brass & Malleable Company, Wyandotte, Michigan.

Eight years of closely-controlled "stand up" tests of milling cutters and thread hobs preceded the selection of TM-6 for exclusive use in threading and tapping machine operations. *The payoff:* Production records, for the past seven years, offer positive proof of 15% better performance by using Vulcan TM-6.

Comparable on-the-job performance information is available for many of Vulcan's other steel grades. For the name of your nearest Vulcan representative write, wire or call collect. Vulcan Crucible Steel Division, H. K. Porter Company, Inc., Aliquippa, Pa.

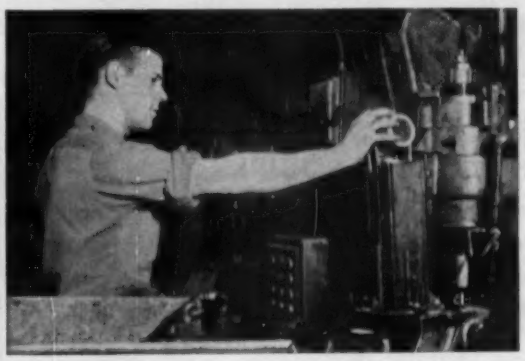


Photo at top shows General Foreman Robert Welch giving "specification plus" okay to DBM fittings as Vulcan representative examines tap used in manufacture.

Photo at left shows typical tapping machine operation at Detroit Brass & Malleable Company's nine-acre site.

HKP VULCAN CRUCIBLE STEEL DIVISION
H. K. PORTER COMPANY, INC.

Now *Precision* TAPPING OF THIN AND BRITTLE MATERIALS

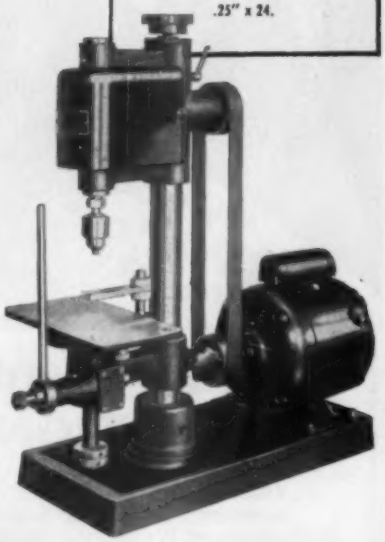
Recent design change provides a simple homing device as a standard component of the

HAMILTON
SUPER SENSITIVE, SMALL-HOLE
PRECISION
TAPPING MACHINE

and makes routine of such problem work as the tapping of precision holes in thin metal sheets or in brittle plastics. Even improves performance in the tapping of blind holes!

Hamilton Super Sensitive, Small-Hole, Precision Tapping Machine.

Capacity — .034" x 120 to .25" x 24.



YOU

will want full information about this important development!

WE WILL FURNISH IT

FREE

ask for

BULLETIN No. 2463

ADDRESS

THE HAMILTON TOOL COMPANY
830 South Ninth Street
HAMILTON, OHIO

IT'S A *Hamilton Tool*
USE IT WITH CONFIDENCE

2463

REPRESENTED IN CANADA BY
Sykes Tool Corporation, Ltd., 123/131 York Street, Toronto
Sykes Tool Corporation, Ltd., 515 Bisson Street, Montreal

IMPACT OF SUPERALLOYS ON MACHINING METHODS AND EQUIPMENT

Here is a summary of the findings of a study made for the Air Research & Development Command of the Air Force entitled "Will Superalloys Set Production Rates Back 25 Years?" reprinted from American Machinist's August 13, 1956 issue. Address:

Reader Service Department
American Machinist
330 W. 42nd St., New York 36, N. Y.

INDEX TO ADVERTISERS

(*Continued from page* 335)

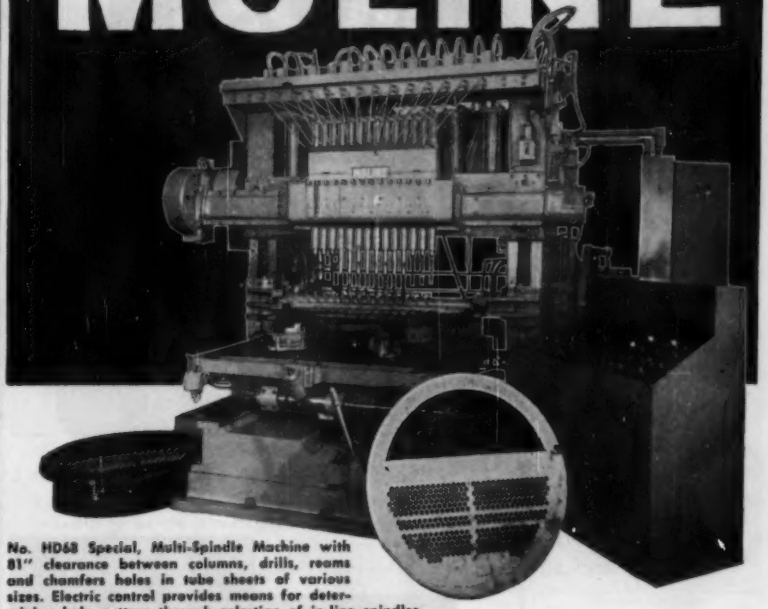
	Page
Horton & Sons Co., E.	Insert Facing 249
Hydraulic Press Mfg. Co. Div. of Koehring Co.	212-213
Ingersoll-Rand Co.	218-219
Jacobs Mfg. Company	277
Jahn Manufacturing Co., B.	262
James Gear Mfg. Co., D. O.	308
Jaquith Carbide Division Pratt & Whitney Co., Inc.	236
Jones & Laughlin Steel Corp.	203
Kaukauna Machine & Foundry Div. Giddings & Lewis Machine Tool Co.	Insert Bet. 32-33
Kennametal Inc.	292
Kent-Owens Machine Company	189
L & J Press Corp.	332
Landis Machine Company	10-11
Landis Tool Company	12-13, 21
LaPointe Machine Tool Company	26-27
Lavallee & Ide Inc.	98
LeBlond Machine Tool Co., R. K.	24-25
Lees-Bradner Company	92
Lehmann Brandes Press Co.	161
Lincoln Electric Company	276
Linley Brothers Co.	270
Lodge & Shipley Company	89
Lufkin Rule Co.	260
Mallory & Company, Inc., P. R.	269
Master Electric Company	110
Mattison Machine Works	216A
M. B. I. Export & Import Ltd.	56
McCaskey Industrial Div. Victor Adding Machine Company	243
McCrosky Tool Corp.	339
McDonough Manufacturing Co.	258
McKay Machine Co.	257
Metal Carbides Corp.	320
Michigan Abrasive Co.	51
Micromatic Hone Corp.	214-215
Miller Electric Mfg. Co., Inc.	338
Mitts & Merrill	334
Modern Industrial Engineering Company	280
Moline Tool Company	337
Monarch Machine Tool Company	52-53
Moore Special Tool Co., Inc.	62
Morris Machine Tool Co.	293

INDEX TO ADVERTISERS

	Page
National Acme Company	49
National Automatic Tool Co., Inc.	36
National Machine Tool Company	230
National Machinery Co.	274
National Tool Company	253
National Twist Drill & Tool Co.	41
Nebel Machine Tool Corp	207
Niagara Machine & Tool Works	66-67
Nice Ball Bearing Company	184B
Nikon Incorporated	316
Noble & Westbrook Mfg. Co.	100
Norton Company, Insert Bet. 64-65, 72	18-19,
O. K. Tool Co., Inc.	3rd Cover
Oakite Products Inc.	266
Oliver Corp. A. B. Farquhar Div.	249
Onsrud Machine Works Inc.	254-255
Pacific Industrial Manufacturing Co.	285
Parker-Kalon Division General American Transportation Corporation	54
Pines Engineering Co., Inc.	317
Pope Machinery Corp.	205
Potter & Johnston Co. Sub. Pratt & Whitney Co., Inc.	81
Pratt & Whitney Co., Inc.	232-233, 236-237, 240-241
Precision Welder & Flexopress Corp.	164
Putnam Tool Company	Insert Bet. 88-89
Randall Co., Inc., Frank E.,	339
Reed Rolled Thread Die Company	101
Reeves Pulley Company Div. of Reliance Electric Engineering Co.	220
Reliance Electric & Engineering Co.	291
Renault Regie National	307
Robbins Co., Omer E.	228
Russell Burdsall & Ward Bolt & Nut Company	305
Ruthman Machinery Company	230
Ryerson & Sons Inc., Joseph T.	168
Scherr Co. Inc., George	312
Sciaky Bros., Inc.	321
Scott Paper Company	313
Seibert & Sons Inc.	294
Sharon Steel Corporation	263
Sheffield Corp.	112-113
Shore Instrument & Mfg. Co., Inc.	312
Simonds Abrasive Co.	59
Simonds Saw & Steel Company	37

(*Continued on page* 338)

MOLINE



No. HD68 Special, Multi-Spindle Machine with 81" clearance between columns, drills, reams and chamfers holes in tube sheets of various sizes. Electric control provides means for determining hole pattern through selection of in-line spindles and control of two-way, positive-positioned hydraulic indexing work table.

For Greater...
PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

Representatives in principal cities. 105

To Cut Your Tapping Costs, GRIND and RE-GRIND YOUR TAPS ACCURATELY!

Use these basic hook angles as a starting point for better tapping.

Aluminum	18°	Cast Iron	5°	Brass	5°
Copper	18°	Magnesium	18°	Plastics	8°
Mild Steel	8°	Stainless Steel	12°		

Write for specific details on how the BLAKE Flute and Chamfer Grinders give you the accuracy you need for low tapping costs.

Controlled Grinding of Tap Flutes and Chamfers

EDWARD BLAKE COMPANY INC.
435 CHERRY ST., WEST NEWTON 65 MASS.

IT'S THE *MOST

ANNOUNCING
the Sensational *NEW*
miller
GOLD STAR
SR

It *DELIVERS* maximum arc stability for:
a. Sounder, denser welds – and more of them – in less time, with . . .
b. ALL electrodes, in . . .
c. Any and all positions

How is this performance possible? THE MILLER GOLD STAR SR introduces a . . .
NEW transformer
plus
NEW weld stabilized current
plus
NEW completely sealed semi-metallic rectifier

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Tested across the country by practical, critical, hard-bitten working weldors, here's what they say about the new Miller GOLD STAR SR:
"it's the DC performance I've always wanted"
"here's DC welding current that's . . . perfect!"
"positively handles ALL electrodes better"
"best deal I've seen for v and o work"
"easiet arc starting in my experience"
"smoothest arc I ever used . . . and . . . quiet!"
"it's just plain the MOST"
Complete particulars on the MILLER GOLD STAR SR, including inert gas and automatic fixture welding, is now available on request.

". . . if it's Miller you know it's the finest . . ."

miller Electric Manufacturing Company, Inc.
APPLETON, WISCONSIN
distributed in Canada by CANADIAN LIQUID AIR CO., LTD., Montreal

WANT TO TOOL WITH PLASTICS?

American Machinist's Special Report Number 410 outlines the plastics most widely used; the new materials now available; and the new toolmaking techniques that are being developed. Case histories illustrate current applications of these methods in Metalworking. Send 25¢ and your name and address to:

Reader Service Department
American Machinist
330 W. 42nd St., New York 36, N. Y.

INDEX TO ADVERTISERS

(Continued from page 337)

	Page
Sinclair Refining Co.	279
Skinner Chuck Company	187
Smit & Sons Inc., J. K.	264
Snow Mfg. Co.	282
Snyder Tool & Engineering Co.	30-31
Sperry Products, Inc.	322
Square D Company	185
Stahl Gear & Machine Company	308
Standard Oil Co. (Indiana)	250-251
Standard Pressed Steel Co.	33, 80
Starrett Co., L. S., The	102-103
Sterling Die Division Pratt & Whitney Co., Inc.	237
Sterling Grinding Wheel Co. Sub. Abrasive & Metal Products Co.	268
Stuart Oil Co. Ltd., D. A.	283
Sundstrand Machine Tool Company	94-95
Surface Combusion Corp.	224-225
Taft-Peirce Mfg. Co.	79
Tannewitz Works, Inc.	290
Texas Co.	114
Tennessee Coal & Iron Div.	20, 234-235
Timken Roller Bearing Co.	4th Cover
Tomkins-Johnson Company	117
Torit Manufacturing Company	248

American Machinist
ADVERTISING SALES STAFF

Atlanta 3 . . . M. H. Miller, 1301 Rhodes-Haverty Bldg., Jackson 3-6951

Boston 16 . . . J. H. Koch, 350 Park Square Bldg., Hubbard 2-7160

Chicago 11 . . . W. J. Haring, Bayard Nicholas, 520 N. Michigan Ave., Mohawk 4-5800

Cincinnati 8 . . . R. H. Anderson, 2637 Erie Ave., East 1-6110

Cleveland 15 . . . Gifford W. Plume, Jr., 1510 Hanna Bldg., Superior 1-7000

Dallas 1 . . . G. L. Jones, Jr., 901 Vaughn Bldg., 1712 Commerce St., Riverside 7-5117

Detroit 26 . . . W. J. Richard, 856 Penobscot Bldg., Woodward 2-1793

Los Angeles 17 . . . H. L. Keeler, 1125 West Sixth St., Madison 6-9351

New York 36 . . . G. H. Krimsier, D. G. Sawer, 500 Fifth Ave., Oxford 5-5959

Philadelphia 3 . . . J. P. Tiebout, Architects' Bldg., 17th & Sansom Sts., Rittenhouse 6-0670

Pittsburgh 22 . . . K. Reeves Cook, 1111 Oliver Bldg., Atlantic 1-4707

St. Louis 8 . . . Bayard Nicholas, 3615 Olive St., Continental Bldg., Jefferson 5-4867

San Francisco 4 . . . R. C. Alcorn, 68 Post St., Douglas 2-4600

England . . . Herbert Lagler, McGraw-Hill House, 95 Farringdon St., London, E. C. 4

INDEX TO ADVERTISERS

	Page
United States Drill Head Co.	216D
U. S. Steel Export Co.	20, 234-235
U. S. Steel Company MX Bars	84
U. S. Steel Corp.	20, 234-235
United States Steel Supply Div. United States Steel Corp.	20, 234-235
U. S. Tool Co., Inc.	87
Van Keuren Co.	310
Van Norman Machine Co.	8-9
Vascaloy-Ramet Corporation	191
Veeder-Root Inc.	32
Verson Allsteel Press Co.	162
Vickers, Incorporated Div. of Sperry-Rand Corporation	245
Vulcan Crucible Steel Div. H. K. Porter Company Inc.	335
Walker-Turner Div. Rockwell Mfg. Co.	45
Warner & Swasey Company	22-23
Weldon Tool Company	308
Westinghouse Electric Corp. Insert Bet. 216A-216D	88, 216
Williams & Co., J. H.	229
Williams White & Co.	320
Wilson Mechanical Instrument Div. American Chain & Cable Co.	306
Winter Brothers Co.	40
Wood & Spencer Company, The	271
Wyckoff Steel Company	242
Youngstown Sheet & Tube Company	231

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EDUCATIONAL
Books 328

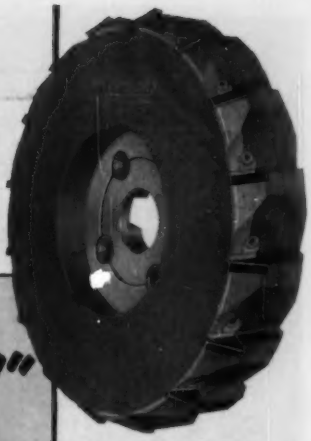
EQUIPMENT
(Used or Surplus New)
For Sale 324-329

ADVERTISERS INDEX

Bennett Machinery Co.	328
Brayson Corp., L. C.	328
Brownell Machine Tools Inc., Hazard	328
Cincinnati Machinery Co.	328
Clifton Hydraulic Press Co.	329
Dony Machinery Co., D. E.	329
Eastern Machinery Co.	327
Falk Mill Supply Co., Inc.	327
Hill-Clarke Machinery Co.	326
Hyman & Sons, Joseph	328
Laurens Bros. Inc.	326
Machine Tool Publications	328
McDonald Machinery Co.	328
Miles Machinery Co.	328
Morey Machinery	325
National Machinery Exchange	328
Noll Equipment Co.	328
Press & Shear Machinery Corp.	326
Straight & Vines Ltd.	329
United Machinery & Tool Corp.	324
Web Machinery	329
Winston Machinery Co. Inc.	329

New McCROSKY Series "900" Milling Cutters

for Milling with "THROW-AWAY" Carbide Inserts

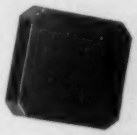


Standard 12" No. 967-T Face Mill Fitted with Triangular Carbide Inserts

These new cutters eliminate the time and cost of re-grinding blades. They reduce the investment in cutters needed to handle a wide variety of work;—cut milling costs;—and provide users with all the other time and cost saving advantages of milling with "Throw-Away" carbide inserts.

Our widely used, patented Super-Jack® Wedges hold the inserts solidly against ground surfaces in the body, preventing any movement even under heavy feeds and speeds, assuring utmost efficiency and dependability. Inserts can be unlocked easily, and indexed quickly and accurately on the machine, providing almost uninterrupted production. Interchangeable with conventional cutters. 16 standard sizes including face and end mills. 4" to 12" diameter. Also "Specials" to meet any requirement. Get full details. Write for our new Bulletin No. 572—Today!

*U. S. Patents 2,508,437; 2,547,789; 2,632, 536



Square Carbide Insert

Triangular Carbide Insert

The complete McCrosky line includes:

Jack-Lock® Milling Cutters — *Wizard®* Quick-Change Chucks
Super® Adjustable Reamers — *Block Type* Boring Bars
Turret Tool Posts — *Specially Engineered* Multiple Operation Tools

Fully descriptive catalogs sent promptly on request. Write for yours today!

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION** MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2¼" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

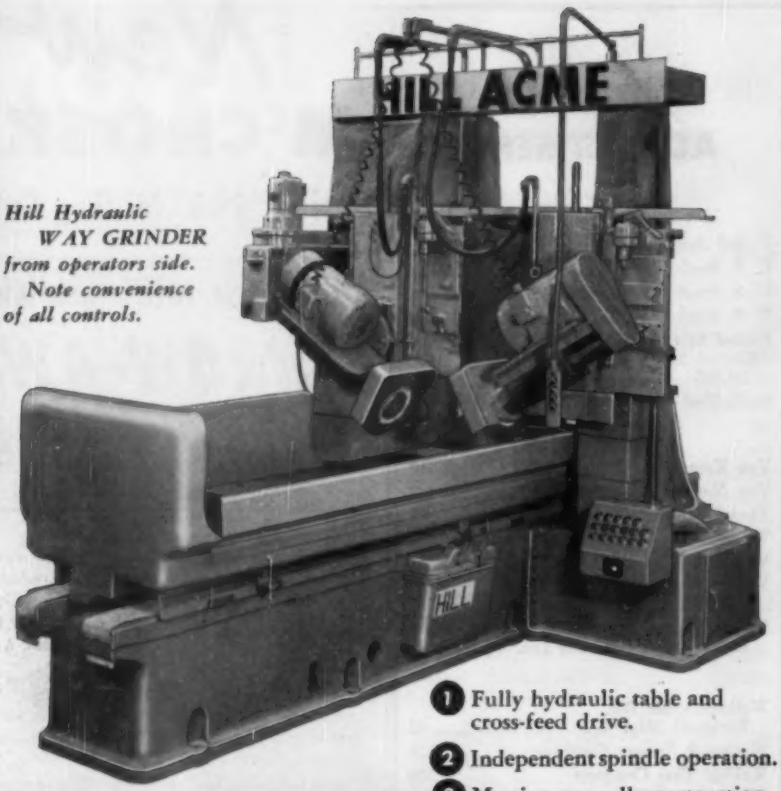
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
245 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1898

HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

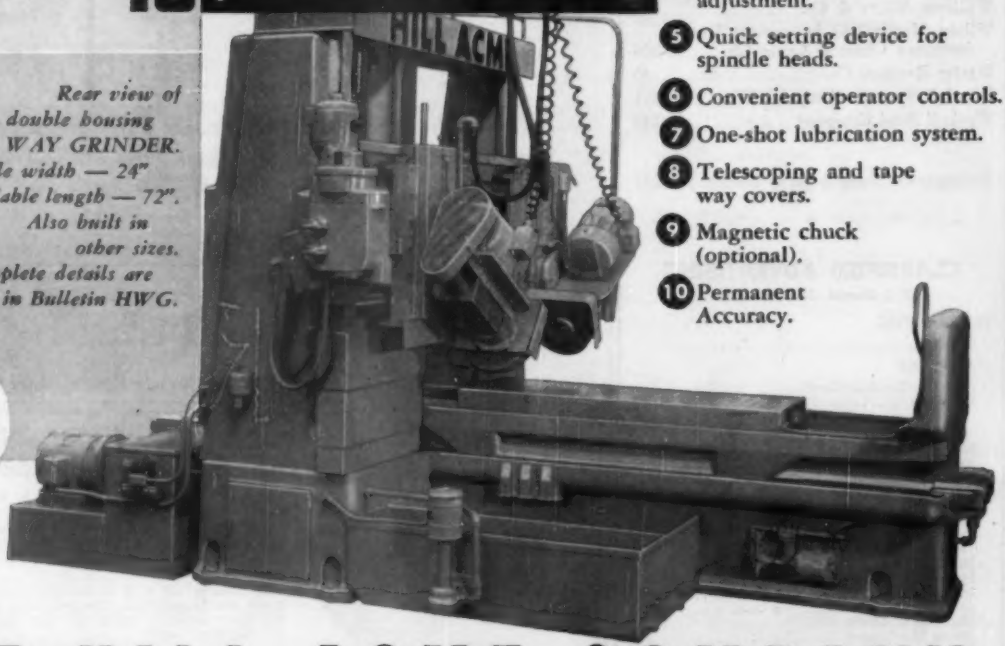
Substantial Savings (up to 50%) over previous methods.



Hill Hydraulic WAY GRINDER from operators side. Note convenience of all controls.

10 points worth considering

1. Fully hydraulic table and cross-feed drive.
2. Independent spindle operation.
3. Massive over-all construction.
4. Rapid traverse and fine feed adjustment.
5. Quick setting device for spindle heads.
6. Convenient operator controls.
7. One-shot lubrication system.
8. Telescoping and tape way covers.
9. Magnetic chuck (optional).
10. Permanent Accuracy.



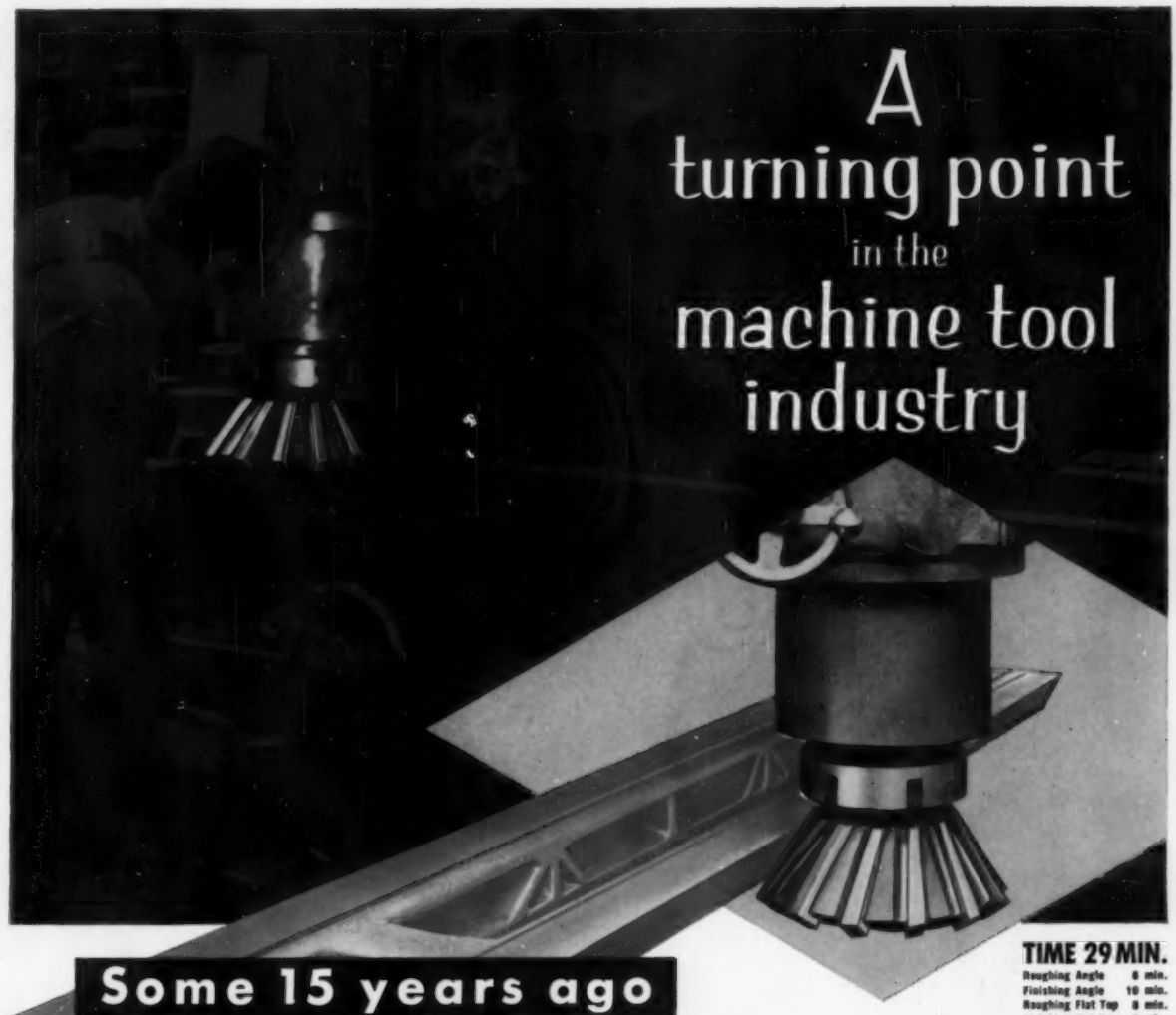
Rear view of HILL double housing WAY GRINDER. Table width — 24" Table length — 72". Also built in other sizes. Complete details are given in Bulletin HWG.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES



A turning point in the machine tool industry

TIME 29 MIN.

Roughing Angle	6 min.
Finishing Angle	10 min.
Roughing Flat Top	8 min.
Finishing Flat Top	3 min.

Some 15 years ago

Gould & Eberhardt changed

INCORPORATED

multi-diam tools
reamers
boring heads
counterbores
form cutters
trepanning tools
gang mills

...changed from planing and hand-scraping to milling and grinding for finishing their 72-inch long meehanite ram used in 36" Industrial Shapers. At that time, not all G & E people were sold on the idea that this particular part was suitable for milling by the proposed new method, but now it is a different story.

Milling, generally speaking, is four times faster than planing; mechanical grinding is ten times faster and more accurate than hand-scraping. Today surface finish is measured by profilometers in millionths of an inch. Along with these advances came quick-acting clamps, quick-change tool adapters, and faster speeds and feeds.

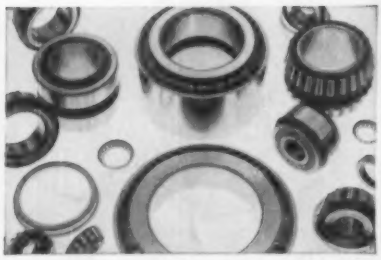
One of the reasons why G & E is sold on milling is the outstanding performance of O K bevel end mills for both the roughing and finishing cuts. They like the simple way blades are set out one serration and ground when dull and the long run between grinds.

For the free audit of any metal-cutting operation, write for our questionnaire. This data is fed into an electronic computer and you will be astonished at some of the results.

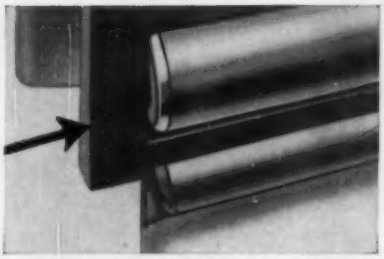
THE OK TOOL COMPANY, INC. • 400 Elm Street • Milford, New Hampshire

modern milling cutters *for* modern milling machines

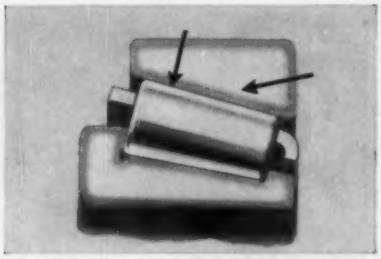
Get all these advantages . . .
specify TIMKEN® tapered roller bearings



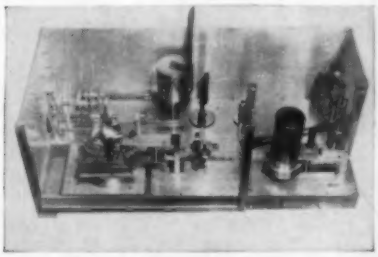
THERE ARE 27 TYPES of Timken® tapered roller bearings. This wide selection means you get the bearing design exactly suited to your job. Whatever your bearing application problem, we can help solve it.



THE SOFT STEEL CAGE used in Timken tapered roller bearings separates the rollers, keeping them spaced evenly. This prevents scuffing of the rollers, adds to the bearing life and gives you more for your money.

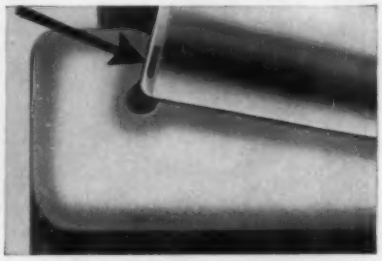


HARD ON THE OUTSIDE, tough on the inside. To take shock loads, give longer life, Timken bearing rollers and races are case-carburized to have a hard, wear-resistant surface over a tough, shock-resistant core.



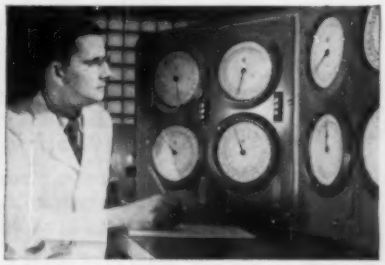
MICRO-INCH FINISH is standard for Timken bearings. This profilograph checks contours and smoothness of circular surfaces to a millionth of an inch, helps us make Timken bearings truer, quieter, longer-wearing.

6,525 SIZES, the world's largest selection of tapered roller bearings. From bearings smaller than your finger to 71½" in inside diameter, the Timken Company can supply the size you need for any specific application.

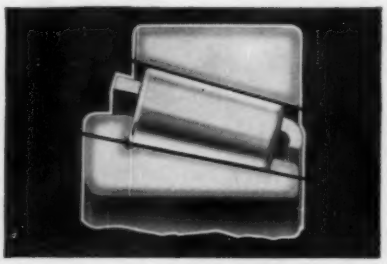


POSITIVE ROLLER ALIGNMENT is assured because the taper in Timken bearings holds ends of rollers snug against the rib. The taper in Timken bearings lets them take radial or thrust loads or any combination.

ACCURATE TO 50 MILLIONTHS of an inch. This Universal Measuring Machine checks gages and machine parts used to make Timken bearings. Our gage laboratory, one of the world's best equipped, helps make Timken tapered roller bearings your No. 1 bearing value.



WE MAKE OUR OWN FINE ALLOY STEEL. No other American bearing maker does. This spectrometer helps control steel quality—in 40 seconds gives the exact chemical analysis of a melt. In a few minutes, results are flashed to the melter. It's another step in rigid quality control.



FULL LINE OF CONTACT between Timken bearings' rollers and races gives them *extra* load-carrying capacity. To get *all* these advantages, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.